

Tab 1

A note on methodology:

Each prompt was run in a Claude Cowork chat with Web Search turned on, running Opus 4.6. If a tool asked me follow up questions, I gave what seemed like a natural answer.

This was run in late February 2026.

The first set of prompts used Claude Cowork Opus 4.6 with web search alone, with no specialized research tools. The others added:

“Scite” used the current Scite MCP server.

“Consensus” used the current default Consensus MCP server. (i.e., not the Connector, or anything I made with the API.)

“Homebrew” is a suite of tools I made that include a MCP server connecting my home library’s Primo catalog, OpenAlex, SemanticScholar, and Crossref, all guided by a Skill of my own devising.

For questions, reach out to Alfred Wallace ([alfred.wallace@und.edu](mailto:alfred.wallace@und.edu))

## Claude + Humanities:

*I have a patron with a reference question:*

*"I'm looking into the transition from alchemy to chemistry in 17th-century England. Who are the essential contemporary scholars on this topic, and where can I find digitized versions of Robert Boyle's non-published laboratory notebooks?"*

*Can you help?*

Great reference question — it touches both historiography and archival access. Let me dig into both parts.

This is a terrific question — it sits at one of the most active intersections in early modern history of science. Here's what I can put together for your patron on both parts.

---

## Essential Contemporary Scholars

The field has been significantly reshaped since the 1990s by what's often called the "New Historiography of Alchemy." The scholars your patron should know:

**Lawrence M. Principe** (Johns Hopkins) is probably the single most important figure working on this transition. His *The Secrets of Alchemy* (2013) is the best accessible overview, and his earlier *The Aspiring Adept: Robert Boyle and His Alchemical Quest* (1998) directly addresses Boyle's alchemical work. Principe and William R. Newman co-authored the foundational article "Some Problems with the Historiography of Alchemy" and the landmark *Alchemy Tried in the Fire: Starkey, Boyle, and the Fate of Helmontian Chymistry* (Chicago, 2002). Principe advocates using the period term "chymistry" to avoid anachronistic distinctions between alchemy and chemistry.

**William R. Newman** (Indiana University, now emeritus) is the other half of that transformative partnership. Newman and Principe, focusing on the exoteric/practical dimensions, have interpreted the coded language of alchemy as references to physical substances and have reconstructed experiments described in medieval and early modern texts. Newman's *Atoms and Alchemy* (2006) and *Promethean Ambitions* (2004) are essential.

**Michael Hunter** (Birkbeck, University of London) is *the* authority on Boyle's manuscripts and archive. He has spent decades scrutinizing the Boyle Papers, which total over 20,000 leaves, and is editor-in-chief of the definitive editions of Boyle's *Works* (14 vols., 1999–2000) and *Correspondence* (6 vols., 2001).

**Allen G. Debus** (d. 2009, but his work remains foundational) essentially created the modern study of this transition. His *Chemistry, Alchemy, and the New Philosophy: 1550–1700* (1987) is a key reference.

**Bruce T. Moran** (University of Nevada, Reno) offers a more moderate historiographic position. Moran argues that alchemists and early chemists operated in overlapping and fluid categories rather than representing a clean break. His *Distilling Knowledge: Alchemy, Chemistry, and the Scientific Revolution* (2005) is excellent for students.

**Antonio Clericuzio** has done important work on Boyle's chemistry specifically, and **Anna Marie Roos** and **Jennifer Rampling** (Princeton) represent newer voices doing significant archival work on English alchemy and chymistry.

---

## Accessing Boyle's Unpublished Laboratory Notebooks

This is the more specific and actionable part. The physical archive resides at the Royal Society in London, but there are multiple digitized access points:

**1. The Workdiaries of Robert Boyle — CELL Online Edition** This is the primary digital resource. An online edition combining facsimiles of the original manuscripts with transcripts, editorial apparatus identifying Boyle's informants, and a full search mechanism is available at [www.livesandletters.ac.uk/wd/](http://www.livesandletters.ac.uk/wd/). These workdiaries, kept from 1647 to 1691, record experiments, extracts from books, and information Boyle received from others. Workdiaries 19 onward are most relevant for experimental activity (especially 19–21, 29, and 37–38), while workdiaries that function as recipe books (6–18, 23, 27, 31, 33–35) document his more hands-on laboratory practice.

**Important caveat:** The Robert Boyle Project website is archived and no longer maintained, and it will continue to be hosted by Birkbeck until 1 April 2028, after which a downloadable copy will be available via Birkbeck Institutional Research Online (BIROn). So your patron should access it sooner rather than later, or download what they need.

**2. Digitized Boyle Papers at Birkbeck** The archived Boyle Project website includes a complete set of digital images of the eleven most important volumes of the Boyle Papers at the Royal Society. These go beyond the workdiaries to include drafts, theological writings, and miscellaneous manuscripts.

**3. Microfilm Edition** A complete microfilm of the archive has been available since 1992 along with Hunter's catalogue. Libraries with strong history of science collections may hold this — it's worth checking WorldCat. The guide was published by University Publications of America as

*Letters and Papers of Robert Boyle: A Guide to the Manuscripts and Microfilm.*

**4. The Royal Society's Own Catalogue** The full archive comprises 74 volumes divided into three categories: 7 guardbooks of letters, 46 volumes of papers, and 21 notebooks and other smaller bound volumes. The Royal Society's online catalogue at [catalogues.royalsociety.org](http://catalogues.royalsociety.org) provides metadata-level access, and visiting researchers can consult the originals in person.

---

A good starting point for your patron would be Hunter's *The Boyle Papers: Understanding the Manuscripts of Robert Boyle* (Ashgate, 2007) as a roadmap to the archive, paired with the CELL workdiaries edition for immediate digital access to the laboratory notebooks themselves. For the broader alchemy-to-chemistry historiographic context, Principe's *Secrets of Alchemy* is the most current and readable entry point.

## Claude + Social Sciences:

*Here's another patron reference question:*

*"What is the current academic standing of 'Broken Windows' theory in criminology? I need to understand the recent longitudinal studies that either support or debunk its effectiveness in reducing violent crime."*

*Can you help?*

Great question — Broken Windows theory is one of those perennially debated topics in criminology. Let me pull together current scholarship on this. Here's a synthesis of where Broken Windows theory stands in current criminological scholarship. The short answer is that it remains one of the most debated frameworks in the field — neither fully vindicated nor fully debunked, but significantly refined and complicated by decades of empirical work.

## The Theory and the Core Debate

Wilson and Kelling introduced the theory in a 1982 Atlantic article, arguing that visible signs of disorder — vandalism, litter, broken windows — signal community indifference and create a permissive environment that escalates into serious crime. The most famous application was New York City's "quality-of-life" policing under Commissioner Bratton in the 1990s.

The central academic challenge comes from **Sampson and Raudenbush's collective efficacy theory** (1999). They argued that the correlation between disorder and crime is spurious — both are actually produced by low levels of neighborhood collective efficacy (shared trust and willingness to intervene), rather than disorder causing crime. Their Chicago neighborhood study found that after controlling for concentrated disadvantage, racial composition, and collective efficacy, disorder was not significantly related to serious crimes except for robbery.

However, this interpretation has been contested. Gault and Silver (2008) argued that Sampson and Raudenbush's own finding — that disorder was negatively associated with collective efficacy — was actually consistent with Wilson and Kelling's original indirect pathway, where disorder erodes informal social control, which in turn leads to crime.

## The Key Recent Studies

**Braga, Schnell, & Welsh (2024)** — This is probably the single most important recent piece. It's an updated systematic review and meta-analysis published in *Criminology & Public Policy*. They identified 56 eligible studies with 59 independent tests of disorder policing interventions —

nearly double the number from their previous review. The headline findings are nuanced and critical:

- Disorder policing strategies were associated with an overall statistically significant crime reduction, with effects that spill over positively into surrounding areas.
- The strongest effects came from community and problem-oriented policing approaches designed to change social and physical disorder conditions at crime hot spots.
- Aggressive order maintenance strategies — the "zero tolerance" approach most associated with Broken Windows policing in practice — did not generate significant crime reductions.

This is a crucial distinction. The meta-analysis essentially says: addressing disorder *can* reduce crime, but *how* you do it matters enormously. Problem-solving approaches work; mass misdemeanor arrests don't.

DOI: 10.1111/1745-9133.12667 — [Check for LibKey Access](#)

**Weisburd, Uding, Hinkle, & Kuen (2024)** — Published in the *Journal of Research in Crime and Delinquency*, this study used multi-wave longitudinal data from 447 street segments in Baltimore. They found that social disorder and crime — rather than physical disorder — were the primary predictors of collective efficacy at the street level. Fear of crime did not have a direct impact on collective efficacy. This partially supports the theory's mechanism but complicates it: it's *social* disorder (people-related incivilities) doing the work, not *physical* disorder (the literal broken windows).

DOI: 10.1177/00224278231168614 — [Check for LibKey Access](#)

**Matsueda (2020/2021 review in *Annual Review of Criminology*)** — This is the best recent theoretical overview, using a potential outcomes framework to evaluate causal claims across the literature. The conclusion was that while there is some evidence supporting both broken windows and collective efficacy theories, there is little consensus in the research literature on the causal question. The review highlights how different methodological approaches — field experiments vs. observational designs vs. simultaneous equation models — yield different answers.

**Taylor's Baltimore longitudinal work** is also worth flagging. Using longitudinal data from Baltimore neighborhoods, Taylor reported modest support for a causal relationship between disorder and subsequent serious crimes, but found that initial neighborhood socioeconomic status was a more powerful predictor. His broader argument is that real, long-term crime reductions require addressing the economic fortunes of residents in high-crime areas, not just surface-level disorder.

A **2025 working paper** (available on arXiv) revisiting the theory with data from New York City and Chicago found support for the theory with respect to abandoned buildings being associated with nearby crime increases, and a similar effect for high-foot-traffic structures, with corresponding increases in perceived danger. However, these effects were highly specific and varied significantly when comparing across cities.

## The Equity Dimension

This is where the literature has moved most decisively. Studies suggest that NYPD's broken windows strategy was associated with increased racial disparities in stops and arrests, enhanced burdens of criminal records for residents of disadvantaged neighborhoods, and a rise in abusive encounters with officers. Arrests for disorder offenses have since fallen dramatically — 74% in New York City, 77% in Washington DC, and 81% in Los Angeles since 2013.

## Where Things Stand

Kelling himself suggested late in his career that the broken windows perspective should perhaps be regarded as a metaphor rather than a theory of crime causation. The emerging consensus might be summarized as:

1. There is *some* causal relationship between disorder and crime, but it's weaker and more indirect than the original theory proposed.
2. The relationship is heavily confounded by underlying socioeconomic conditions and collective efficacy.
3. *Community-oriented* disorder interventions can reduce crime; *aggressive enforcement* approaches generally don't, and they carry serious equity costs.
4. Social disorder matters more than physical disorder for the mechanisms the theory describes.
5. Effects are highly place-specific and don't generalize cleanly across cities.

For the patron's purposes, I'd recommend starting with the **Braga, Schnell, & Welsh (2024) meta-analysis** and the **Matsueda review** as the two anchoring pieces — one empirical, one theoretical — and then branching out from their reference lists. Would it also be helpful if I put together a short bibliography document they could take with them?

## Claude + STEM:

*A patron asked me this reference question:*

*"I need to understand the 'surface code' approach to quantum error correction. What are the most cited foundational papers from the last five years, and which labs (academic or corporate) are currently achieving the lowest error rates?"*

*Can you help?*

Great reference question! Let me pull together current information on both the key papers and the leading labs.

Alfred, this is a great question. Here's a synthesis of the key papers and the current lab landscape for your patron.

---

## Foundational / High-Impact Papers (Last ~5 Years)

There's a clear sequence of landmark experimental papers that define the recent trajectory of surface-code QEC. These are the ones your patron should start with:

### **1. Google Quantum AI, "Suppressing quantum errors by scaling a surface code logical qubit," *Nature* 614, 676–681 (2023).**

This was the first demonstration on any platform that increasing the size of a surface code actually reduces the logical error rate. Their distance-5 surface code logical qubit modestly outperformed an ensemble of distance-3 logical qubits, with a logical error per cycle of about 2.914% versus 3.028%. A modest improvement, but it was the proof of concept that hardware had crossed the threshold where scaling helps rather than hurts.

DOI: 10.1038/s41586-022-05434-1 — [Check for LibKey Access](#)

### **2. Bluvstein et al. (Harvard/MIT/Lukin group), "Logical quantum processor based on reconfigurable atom arrays," *Nature* 626, 58–65 (2024).**

This paper reported a programmable quantum processor based on encoded logical qubits using up to 280 physical qubits in reconfigurable neutral-atom arrays. They demonstrated improvement of a two-qubit logic gate by scaling surface code distance from  $d=3$  to  $d=7$ , along with color code qubits at break-even fidelity and computationally complex sampling circuits with up to 48 logical qubits. This was a landmark for showing that neutral-atom platforms can do large-scale

logical operations, not just superconducting qubits.

DOI: 10.1038/s41586-023-06927-3 — [Check for LibKey Access](#)

**3. Google Quantum AI, "Quantum error correction below the surface code threshold," *Nature* 638, 920–926 (2025).**

Using their Willow processor, they demonstrated a distance-7 surface code with 101 qubits achieving  $0.143\% \pm 0.003\%$  error per cycle of error correction, with a logical error suppression factor of  $\Lambda = 2.14 \pm 0.02$  when increasing code distance by 2. The logical memory exceeded its best physical qubit's lifetime by a factor of 2.4, and they maintained below-threshold performance when decoding in real time. This is currently the strongest surface-code-specific result for superconducting qubits.

DOI: 10.1038/s41586-024-08449-y — [Check for LibKey Access](#)

**4. Bluvstein et al. (Harvard/MIT), "A fault-tolerant neutral-atom architecture for universal quantum computation," *Nature* (2025).**

Using up to 448 neutral atoms, they implemented the key elements of a universal, fault-tolerant architecture, including surface codes with repeated QEC showing  $2.14\times$  below-threshold performance, logical entanglement via transversal gates and lattice surgery, and universal logic through transversal teleportation. This paper goes beyond memory to demonstrate a more complete fault-tolerant architecture.

DOI: 10.1038/s41586-025-09848-5 — [Check for LibKey Access](#)

**5. USTC (China), "Experimental Quantum Error Correction below the Surface Code Threshold via All-Microwave Leakage Suppression," *Phys. Rev. Lett.* 135, 260601 (2025).**

This team demonstrated a quantum memory operating below threshold on a distance-7 surface code using an all-microwave leakage suppression architecture, achieving a logical error suppression factor of  $\Lambda = 1.40(6)$ . This is notable as the first Chinese lab to independently demonstrate below-threshold surface code operation, and their focus on solving the leakage problem through a hardware-efficient approach is distinct.

DOI: 10.1103/rqkg-dw31 — [Check for LibKey Access](#)

**Additional key papers to be aware of:**

- **Krinner et al. (ETH Zurich), "Realizing repeated quantum error correction in a distance-three surface code," *Nature* 605, 669–674 (2022).** An early demonstration of repeated syndrome extraction on a surface code. DOI: 10.1038/s41586-022-04566-8 —

[Check for LibKey Access](#)

- **Quantinuum (Da Silva et al.), "Demonstration of logical qubits and repeated error correction with better-than-physical error rates," arXiv:2404.02280 (2024).** While Quantinuum primarily uses color codes rather than surface codes, their results are constantly cited in the surface code literature as a comparison point.

---

## Who's Achieving the Lowest Error Rates?

The competitive landscape breaks down roughly by hardware platform:

**Google Quantum AI (superconducting qubits)** currently holds the best surface-code-specific result: a distance-7 code achieving an error suppression factor  $\Lambda > 2$ , with the logical qubit's lifetime exceeding its best physical qubit by more than  $2\times$ . Their Willow chip is the state of the art for superconducting surface codes.

**Harvard/MIT Lukin group (neutral atoms)** has demonstrated the largest-scale logical qubit operations, with up to 448 atoms, and has matched Google's suppression factor on surface codes while also demonstrating a broader range of fault-tolerant operations (lattice surgery, transversal gates, teleportation). QuEra, the commercial spinoff, is building on this work.

**Microsoft + Quantinuum (trapped ions)** took a different approach, using color codes rather than surface codes, but achieved a striking headline result: logical circuit error rates 800 times lower than corresponding physical error rates, running over 14,000 individual experiments without a single error. They later expanded to 12 logical qubits on Quantinuum's 56-qubit H2 machine with 99.8% two-qubit fidelity. Quantinuum's two-qubit gate fidelity of 99.914% on their H1 system is among the highest reported anywhere.

**USTC (China)** is the newest entrant to below-threshold surface code performance, with their leakage-suppression approach on superconducting hardware.

**IBM** has been pursuing surface-code variants adapted to their heavy-hexagon processor topology and has also published work on quantum LDPC codes (the "gross code"), but hasn't yet published a below-threshold surface code result comparable to Google's.

---

For your patron, I'd suggest starting with papers #1 and #3 (the two Google *Nature* papers) to understand the surface code progression on superconducting hardware, then #2 and #4 (the

Harvard/MIT papers) for the neutral-atom perspective. The Terhal review "Quantum error correction for quantum memories," *Rev. Mod. Phys.* 87, 307–346 (2015) (DOI: 10.1103/RevModPhys.87.307 — [Check for LibKey Access](#)) remains the standard theoretical reference, and Fowler et al.'s 2012 "Surface codes: towards practical large-scale quantum computation" (*Phys. Rev. A* 86, 032324) is the foundational architectural blueprint that everyone still cites.

Want me to put together a Zotero-importable BibTeX file of these?

## Claude + Complex query:

*I have another patron reference question:*

*"I am researching the 'Sidewalk Labs' project in Toronto as a case study. What does the urban planning literature say about its failure, and what municipal or civil liberties reports (e.g., CCPA or CCLA) provide the best 'post-mortem' on the privacy concerns raised?"*

*Can you help?*

Great question — the Sidewalk Labs Toronto (Quayside) project is a rich case study at the intersection of smart cities, data governance, and public trust. Let me dig into both the academic literature and the civil liberties reports for your patron. Excellent question for a case study — there's a substantial body of work on this. Let me organize the response into the two areas your patron is asking about.

---

## Academic / Urban Planning Literature

The Sidewalk Labs Quayside project (2017–2020) has generated a rich scholarly literature. Here are the most important pieces:

### **Foundational legal/governance analysis:**

Goodman and Powles authored the key early analysis, "Urbanism Under Google: Lessons from Sidewalk Toronto," published in the *Fordham Law Review* (Vol. 88, No. 2, 2019, pp. 457–498). It examines three governance challenges posed by the project — privatization, platformization, and domination — and argues that the smart city vision may be fundamentally incompatible with democratic processes and public accountability. [Check for LibKey Access](#)

### **Political economy of the failure:**

Filion and Moos, "Urban Neoliberalism, Smart City, and Big Tech: The Aborted Sidewalk Labs Toronto Experiment" in the *Journal of Urban Affairs* (Vol. 45, No. 9, 2023), identify three categories of obstacles that derailed the project: opposition movements objecting to electronic surveillance and corporate control, fragmentation within the neoliberal political bloc, and ill-advised strategies by Sidewalk Labs itself. DOI: 10.1080/07352166.2022.2081171 — [Check for LibKey Access](#)

### **Democratic governance critique:**

Kollar, "Failure to Innovate: Urban Technocracy and the Making and Unmaking of Sidewalk Labs' Smart City" (MIT, published in *Projections*, 2023), frames the project as a cautionary tale about smart city models worldwide, arguing that Sidewalk Labs sought to establish an autonomous urban zone effectively excluded from democratic oversight and governed by the company itself.

### **Data governance and the Urban Data Trust:**

Artyushina, "Is Civic Data Governance the Key to Democratic Smart Cities? The Role of the Urban Data Trust in Sidewalk Toronto" in *Telematics and Informatics* (Vol. 55, 2020), analyzes how Sidewalk Labs' proposed Urban Data Trust was positioned as a steward of public interest but actually sustained a rent-seeking political-economic regime. DOI: 10.1016/j.tele.2020.101456 — [Check for LibKey Access](#)

### **Platform capitalism framing:**

The *Canadian Journal of Communication* published "Smart City Toronto: Extraction, Enclosure, Rentier Capitalism," which uses a political economy lens to explain why the Alphabet subsidiary sought to expand the project beyond its original parameters, ultimately triggering the political backlash that killed it. DOI: 10.22230/cjc.2022v47n2a4185 — [Check for LibKey Access](#)

### **Social acceptance analysis:**

A *Frontiers in Environmental Science* article, "Social Acceptance of Smart City Projects: Focus on the Sidewalk Toronto Case" (2022), traces the erosion of public trust through a detailed timeline — from initial citizen distrust of Google's data intentions, through the resignations of privacy expert Ann Cavoukian and advisory panel member Saadia Muzaffar, to the CCLA lawsuit and the #BlockSidewalk movement. DOI: 10.3389/fenvs.2022.898922

### **Discourse analysis:**

Olmstead, "Sidewalk Toronto and the Discursive Politics of the Real-Time City" (*Time & Society*, 2025), examines how Sidewalk Labs used the language of "real-time" as a rhetorical vehicle for broader sociopolitical aims, and how the project became what one scholar called "a barometer of the smart city arena."

Also worth noting is the edited collection "**Smart Cities in Canada: Digital Dreams, Corporate Designs**" from the Centre for Free Expression at Toronto Metropolitan University (formerly Ryerson), which documented the broader lessons and questioned whether city officials learned to be suspicious of tech companies bearing smart city solutions that don't address a city's actual priority problems.

---

## Civil Liberties and Policy Reports

### CCLA (Canadian Civil Liberties Association):

The CCLA was the single most important civil liberties actor in the Sidewalk Labs saga. Their work is extensively documented on their dedicated case page at [ccla.org/major-cases-and-reports/torontos-smart-city/](https://ccla.org/major-cases-and-reports/torontos-smart-city/). Key milestones:

- CCLA's foundational concern was that Sidewalk Labs' original 437-page "yellow book" vision outlined a city where residents would be rewarded based on how much data they shared, and the company proposed authority to tax residents, control public services including schools and transit, and even establish its own police authority.
- In March 2019, CCLA Executive Director Michael Bryant publicly warned the project would create a "constitution-free zone" where personal information could be collected in circumstances that would normally require a warrant. The CCLA sent an open letter to PM Trudeau, Premier Ford, and Mayor Tory demanding a "reset" — insisting all three levels of government must establish data governance rules before any procurement could proceed.
- In April 2019, the CCLA filed a formal lawsuit against all three levels of government and Waterfront Toronto, seeking to nullify the partnership agreement. The notice of application alleged the project was replete with potential privacy breaches violating Canadians' constitutional rights under the Charter of Rights and Freedoms.
- CCLA's Dr. Brenda McPhail (Director of Privacy, Technology & Surveillance) co-authored an important commentary arguing that despite the media coverage, there had never been meaningful public conversation about privacy — Sidewalk's claims of "world-leading best practices" were never seriously examined in any public forum. Available at: [ccla.org](https://ccla.org) — "[We're Not Done Talking About Privacy in the Smart City](#)"

### CCPA (Canadian Centre for Policy Alternatives):

The CCPA published "Canada's Smart Tech Future: Open Cities or Opaque Surveillance?" (2024), which uses the Sidewalk Labs failure as a key reference point, contrasting its top-down corporate model with the federal government's Smart Cities Challenge, whose winners emphasized resident-led design and democratic transparency. The piece also connects the smart city surveillance model to the broader rise of intelligence-led policing and "real-time operations centres" in Canadian police services. Available at: [policyalternatives.ca](https://policyalternatives.ca)

## **Ontario Auditor General:**

It's also worth flagging that Ontario's Auditor General took Waterfront Toronto to task for its role in the project (December 2018), which added to the institutional legitimacy of the privacy concerns.

---

## **Summary for the Patron**

For a case study, I'd recommend structuring the literature around three threads: (1) the political economy of why Big Tech smart city projects tend toward scope creep and democratic circumvention (Filion & Moos; the CJC article; Kollar); (2) the specific data governance failures and the Urban Data Trust debacle (Artyushina; Goodman & Powles); and (3) the civil society response and its constitutional dimensions (CCLA case page and lawsuit documents; CCPA report; the Tusikov and Wylie public commentary). The Frontiers social acceptance article is also a strong framework piece for understanding how public trust eroded over time.

Would it be helpful if I pulled any of these into a formatted bibliography or pathfinder document?

## Scite + Humanities:

*Hi, I have a patron with a reference question:*

*"I'm investigating the Quanzhou shipwrecks and their implications for 13th-century maritime trade. What does the recent scholarly literature say about the cargo's origins, and what archaeological reports or primary maritime logs should I consult?"*

*Can you help, using Scite?*

I'll search for scholarly literature on the Quanzhou shipwrecks and their maritime trade implications. Let me run a few targeted searches to cover different angles. Here's what I found across the scholarly literature. This is a rich topic with some excellent recent work.

---

### Core scholarly articles on the Quanzhou shipwrecks and cargo provenance:

The foundational overview is **Pearson, R., Li Min, & Li Guo (2002), "Quanzhou Archaeology: A Brief Review,"** *International Journal of Historical Archaeology*, 6(1), 23–59. This reviews the published archaeological record of Quanzhou including the **Houzhū and Fashi sunken ships**, kiln sites, temples, and tombs. It's an essential starting point for understanding the archaeological context of the port. [Check for LibKey Access](#)

For cargo and trade patterns specifically, **Li, P. (2020), "The trade patterns of the South China Sea during the Song period,"** *Asian Archaeology*, 3(1–2), 83–93, is directly on point. Li examines cargo distribution on the Quanzhou Bay wreck alongside the Intan, Cirebon, and Nanhai No. 1 wrecks, and distinguishes two trade models: a "single authority" pattern (bulk cargo for one destination) versus a "peddler trade" pattern involving multiple traders selling at various ports of call. The Quanzhou Bay wreck fits the latter model. This is open access. [Check for LibKey Access](#)

**On cargo origins and porcelain provenance**, the most cutting-edge work is **Xu, W., Chen, Z., & Xiao, D. (2024), "Unveiling maritime trading practices: micro-provenance analysis of Dehua-style porcelain from the Nanhai I shipwreck,"** *Antiquity*, 99(404), 517–535. This uses portable X-ray fluorescence to trace Dehua-style *qingbai* porcelain to specific kiln sub-regions within Dehua County, Quanzhou. They identify two production subregions (Gaide and Longxun-Sanban) and show that buyer/seller choice shaped which kilns supplied specific vessel types. Open access. [Check for LibKey Access](#)

A brand-new article is **"Ceramic Trade between Quanzhou and the Malay Peninsula from the Eleventh to the Thirteenth Centuries" (2025)** in the *Malaysian Journal of History, Politics*

and *Strategic Studies*, which combines Chinese textual sources with shipwreck data. [Check for LibKey Access](#)

**On non-ceramic cargo**, Ding, L., Ma, Y., & Fu, Y. (2020) identified **ambergris** residue from the original 1973 Quanzhou ship excavation using GC-QTOF mass spectrometry, confirming what archaeologists had previously judged by visual inspection — that the ship carried incense wood and ambergris as trade goods. [Check for LibKey Access](#)

Similarly, Li, N., Dong, J., & Ning, M. (2025), "**Research on the Glass Beads from the Nanhai I Shipwreck**," traces potash-lead glass beads to a technological tradition originating from Han Dynasty Lingnan, showing that even small finds like beads reveal deep trade connections. [Check for LibKey Access](#)

**On ship construction and the broader maritime context**, Flecker, M. (2007), "**The South-China-Sea Tradition: the Hybrid Hulls of South-East Asia**," *International Journal of Nautical Archaeology*, 36(1), 75–90, is widely cited (28 citing publications) and discusses the hybrid hull construction techniques seen in South China Sea wrecks including the Quanzhou vessel. [Check for LibKey Access](#)

---

### **Primary sources and archaeological reports to recommend:**

For the original excavation, the patron should look for the **1975 Quanzhou excavation report** (泉州湾宋代海船发掘与研究), published by the Fujian Provincial Museum. This is the primary archaeological source for the Quanzhou Bay wreck discovered in 1973. Much of it is in Chinese, but it's widely cited in the English-language literature (Li 2020 references it as "Quanzhou 1975").

For the Nanhai I wreck (closely related, also originating from the Quanzhou port), the **National Center of Underwater Cultural Heritage et al. (2018)** excavation reports document the ship's dimensions (~22.1m length, ~9.35m width) and cargo assemblage.

For primary maritime logs and historical texts, the classic source is **Zhao Rugua's Zhufanzhi** (諸蕃志, "**Description of the Barbarians**," c. 1225), written by the Superintendent of Maritime Trade at Quanzhou — essentially a contemporary administrative account of the goods, peoples, and places involved in 13th-century maritime commerce. There are English translations available (notably Hirth & Rockhill, 1911).

I should note that I was not able to find every article through scite's index — some of the Chinese-language archaeological reports and older excavation monographs aren't indexed there, so the patron may want to supplement with searches in CNKI (China National Knowledge Infrastructure) for Chinese-language sources.

## Scite + Social sciences:

*Hello--a patron has this research question:*

*"The 'Coddling of the American Mind' thesis suggests a direct causal link between smartphones and the youth mental health crisis. What is the current state of the literature regarding 'causality vs. correlation' in this field, and who are the primary researchers challenging the causal narrative?"*

*Can you help, with Scite?*

Great question! Let me search the literature on this debate. I'll run several targeted searches to cover both the causal claims and the critical responses.

The results are quite large. Let me read through the key findings from each search.

Good, I found some key papers. Now let me search specifically for the critics — particularly Orben, Przybylski, and others who have published skeptical work.

Now let me get some key papers by the main critics and read deeper into them.

Now let me get one more targeted search for Hancock's meta-analysis and any recent review/debate pieces.

Excellent. I now have a comprehensive picture of the key literature. Here's a synthesis for your patron:

---

This is an active and contentious debate in the research literature. Here's an overview of where things stand, organized around the key positions and researchers.

### The Causal Argument (Haidt/Twenge Side)

The most prominent advocates for a causal link are Jonathan Haidt (NYU) and Jean Twenge (San Diego State). Twenge's earlier work established the correlational foundation, arguing that increases in depression, self-harm, and suicide among U.S. adolescents after 2012 track with smartphone adoption. Her 2020 paper in *Psychiatric Research and Clinical Practice* lays out possible mechanisms for these links. Haidt, along with Twenge, has elaborated these arguments in popular and academic venues, including a 2020 *Nature* piece co-authored with Nick Allen on scrutinizing the effects of digital technology on mental health.

Key papers on this side:

- Twenge, J. M. (2020). Increases in Depression, Self-Harm, and Suicide Among U.S. Adolescents After 2012 and Links to Technology Use: Possible Mechanisms. *Psychiatric*

*Research and Clinical Practice*, 2(1). [Check for LibKey Access](#)

- Twenge, J. M., & Campbell, W. K. (2018). Associations between screen time and lower psychological well-being among children and adolescents: Evidence from a population-based study. *Preventive Medicine Reports*, 12, 271–283. [Check for LibKey Access](#) — This is a highly cited paper with 46 supporting Smart Citations and 5 contrasting citations in scite.
- Haidt, J., & Allen, N. (2020). Scrutinizing the effects of digital technology on mental health. *Nature*, 578, 226–227. [Check for LibKey Access](#)

### The Skeptical/Critical Side

Several researchers have published influential work arguing that the evidence does not support a strong causal claim. The main critics include:

Amy Orben & Andrew Przybylski (Oxford Internet Institute) — Perhaps the most methodologically rigorous critics. Their landmark 2019 paper in *Nature Human Behaviour* used specification curve analysis across three large datasets and found that the association between digital technology use and adolescent well-being was negative but tiny — comparable in magnitude to the effect of wearing glasses or regularly eating potatoes. Their companion paper in *Psychological Science* using time-use diary data reached similar conclusions.

- Orben, A., & Przybylski, A. K. (2019). The association between adolescent well-being and digital technology use. *Nature Human Behaviour*, 3, 173–182. [Check for LibKey Access](#) — This is one of the most heavily cited papers in this debate: 58 supporting, 3 contrasting, and 860 mentioning Smart Citations in scite.
- Orben, A., & Przybylski, A. K. (2019). Screens, Teens, and Psychological Well-Being: Evidence From Three Time-Use-Diary Studies. *Psychological Science*, 30(5), 682–696. [Check for LibKey Access](#)

Candice Odgers (UC Irvine) — Published a major annual research review in *JCPP* arguing that the fears about digital technology are outpacing the actual evidence, and that the discourse has overlooked how technology can also benefit adolescents, particularly marginalized youth.

- Odgers, C. L., & Jensen, M. (2020). Annual Research Review: Adolescent mental health in the digital age: facts, fears, and future directions. *Journal of Child Psychology and Psychiatry*, 61(3), 336–348. [Check for LibKey Access](#)

- Odgers, C. L. (2018). Smartphones are bad for some teens, not all. *Nature*, 554, 432–434. [Check for LibKey Access](#)

Matti Vuorre & Andrew Przybylski — Their global-level analysis examined internet/broadband adoption data across countries and found little or no evidence that internet adoption has been harmful to well-being or mental health at the population level, including among adolescents.

- Vuorre, M., & Przybylski, A. K. (2023). Global Well-Being and Mental Health in the Internet Age. *Clinical Psychological Science*, 11(5). [Check for LibKey Access](#)

Jeffrey Hancock (Stanford Social Media Lab) — His group's meta-analysis of the relationship between social media use and well-being found that the overall associations are small and inconsistent, arguing that the narrative of widespread harm is not well supported by the aggregate evidence.

- Hancock, J. T., Liu, X., & Luo, M. (2022). Psychological Well-Being and Social Media Use: A Meta-Analysis of Associations between Social Media Use and Depression, Anxiety, Loneliness, Eudaimonic, Hedonic and Social Well-Being. *SSRN Electronic Journal*. [Check for LibKey Access](#)

#### Where the Debate Stands

The core methodological critiques from the skeptics include: most studies are cross-sectional rather than longitudinal (making causal inference difficult); effect sizes tend to be very small; results are highly sensitive to which analytical specifications researchers choose (the "specification curve" issue); and self-reported screen time is an unreliable measure. Meanwhile, proponents of the causal view argue that converging trend data, experimental studies, and specific mechanism pathways (social comparison, sleep disruption, cyberbullying) strengthen the case beyond simple correlations.

A recent meta-analysis in *Scientia Psychiatrica* (Gabrielle et al., 2024) found small but statistically significant associations between social media use and depressive symptoms ( $r = 0.12$ ), anxiety ( $r = 0.10$ ), and loneliness ( $r = 0.15$ ) — the question remains whether "small but significant" constitutes a crisis-level causal factor.

This should give your patron a solid entry point into both sides of the debate. The Orben & Przybylski (2019) *Nature Human Behaviour* paper and the Odgers & Jensen (2020) *JCPP* review are probably the two strongest starting points for the critical perspective, while Twenge (2020) and Haidt & Allen (2020) anchor the causal argument side.

## Scite + STEM:

*Hello--a patron has this reference question:*

*"Following the LK-99 and subsequent controversies, what is the current, peer-reviewed status of near-ambient pressure superconductivity research? Who are the most reputable skeptics and proponents currently publishing in Nature or Science on this?"*

*Can you help with Scite?*

Great question! Let me search the literature on this topic across a few angles.

Now let me pull the Nature and Science results and also search for the specific Dias retractions and key skeptics.

Let me get a few more targeted searches for the key figures in this debate.

I now have a good picture of the literature. Here's a comprehensive answer for your patron:

---

## Current Status of Near-Ambient Pressure Superconductivity Research (Post-LK-99)

### The LK-99 Verdict

The scientific consensus is clear: **LK-99 is not a superconductor**. Multiple independent replication efforts found that the anomalies reported by the original Korean group (resistivity drops, partial levitation, diamagnetic signals) were attributable to Cu<sub>2</sub>S impurity phases in the sample, not superconductivity. Key replication papers include:

- Habamahoro, Bontke, & Chirom (2024), "Replication and study of anomalies in LK-99," in *Superconductor Science and Technology*, which reproduced all the original anomalies and traced them to Cu<sub>2</sub>S structural transitions. [Check for LibKey Access](#)
- Kumar, Karn, & Kumar (2023), "Absence of Superconductivity in LK-99 at Ambient Conditions," in *ACS Omega* — a highly cited paper (40 citing publications) confirming LK-99 is a resistive insulator. [Check for LibKey Access](#)
- Sukhenko & Karbovsky (2024), "Reflecting on the LK-99 fervour: insights and future prospects," in *Journal of Physics: Condensed Matter*, offers a comprehensive review

concluding the material's synthesis produces unpredictable multiphase products. [Check for LibKey Access](#)

*Nature* covered the debunking with Dan Garisto's reporting: "LK-99 isn't a superconductor — how science sleuths solved the mystery" (Garisto, 2023). [Check for LibKey Access](#)

## The Ranga Dias Retractions

The other major controversy involved **Ranga Dias** (University of Rochester), whose two headline claims of room-temperature superconductivity were both retracted from *Nature*:

- The 2020 carbonaceous sulfur hydride (CSH) paper (retracted Sept. 2022) due to questionable background subtractions in magnetic susceptibility data.
- The 2023 nitrogen-doped lutetium hydride (Lu-N-H) paper (retracted Nov. 2023). [Check for LibKey Access](#)

A *Nature* editorial (2024) summarized the lessons: "Retractions are part of science, but misconduct isn't — lessons from a superconductivity lab," reporting that a University of Rochester review panel concluded it was "more likely than not" that Dias committed data fabrication, falsification, and plagiarism. [Check for LibKey Access](#)

Multiple groups published negative replications of the Lu-N-H claim in *Nature Communications*, including Ferreira, Conway, et al. (2023), a comprehensive computational study of over 200,000 structures in the Lu-N-H system finding none compatible with room-temperature superconductivity (71 citing publications). [Check for LibKey Access](#)

## Legitimate High-Pressure Hydride Superconductivity

Separate from the Dias controversy, **high-pressure hydride superconductivity remains a verified phenomenon** — but it requires extreme pressures (100+ GPa), far from "ambient." Key validated work includes:

- **Mikhail Eremets** (Max Planck Institute for Chemistry) is the most prominent and reputable proponent. His group's 2023 paper in *Nature Physics* on magnetic flux trapping in  $\text{H}_3\text{S}$  and  $\text{LaH}_{10}$  provided strong independent evidence for superconductivity in these high-pressure hydrides (101 Smart Citations, 9 supporting, 5 contrasting). [Check for LibKey Access](#)
- Chen, Huang, Semenok et al. (2023) in *Nature Communications* demonstrated enhanced superconductivity ( $T_c \sim 176$  K) in La-Ce-H ternary hydrides at  $\sim 100$  GPa, showing that alloying can maintain high  $T_c$  at somewhat reduced pressures (106 citing publications).

[Check for LibKey Access](#)

- Chen, Luo, Cao et al. (2024) in *Nature Communications* reported Y-Ce alloy hydrides with Tc up to 141 K at 124 GPa. [Check for LibKey Access](#)
- **Ho-kwang Mao** (2024) wrote a perspective in *National Science Review* affirming that near-room-temperature superconductivity has been reached in hydrogen-dominant compounds at high pressures, while acknowledging the Dias retractions. [Check for LibKey Access](#)
- A very recent paper (Liu, Zhuang, & Xu, 2025) in *Science Advances* reported a Tc of 204 K in a molecular-type hydride CaH<sub>14</sub> at lower pressures (~80 GPa), suggesting a pathway to reduce required pressures. [Check for LibKey Access](#)

## The Most Prominent Skeptic

**Jorge E. Hirsch** (UC San Diego) has been the most vocal and persistent skeptic, particularly regarding the Dias group's claims and, more broadly, elements of the hydride superconductivity evidence base. His 2024 preprint "How do you trust but verify hydride superconductivity?" directly challenged the evidentiary standards being applied in the field. He was instrumental in identifying anomalies in the original Dias CSH data that eventually led to its retraction.

## Exciting Adjacent Development: Nickelate Superconductors

The field's attention has also shifted toward **nickelate superconductors** as a promising new class. La<sub>3</sub>Ni<sub>2</sub>O<sub>7</sub> was reported to superconduct at ~80 K under pressure (~14 GPa), generating significant activity in *Nature Communications*. Most recently, Chow, Luo, & Ariando (2025) reported bulk superconductivity near 40 K in hole-doped SmNiO<sub>2</sub> **at ambient pressure** in *Nature* itself — a significant milestone. [Check for LibKey Access](#)

## Bottom Line for the Patron

The peer-reviewed consensus is that **no verified room-temperature, ambient-pressure superconductor exists**. LK-99 and the Dias claims have both been thoroughly debunked. Legitimate high-pressure hydride superconductivity (Eremets's group and collaborators) is real but requires extreme conditions. The current frontier is reducing required pressures, with nickelate superconductors and engineered ternary hydrides as the most active areas of research.

## References

Chow, L. E., Luo, Z., & Ariando, A. (2025). Bulk superconductivity near 40 K in hole-doped SmNiO<sub>2</sub> at ambient pressure. *Nature*. <https://doi.org/10.1038/s41586-025-08893-4>

Chen, W., Huang, X., & Semenov, D. V. (2023). Enhancement of superconducting properties in the La–Ce–H system at moderate pressures. *Nature Communications*, 14(1). <https://doi.org/10.1038/s41467-023-38254-6>

Dasenbrock-Gammon, N., et al. (2023). Retraction Note: Evidence of near-ambient superconductivity in a N-doped lutetium hydride. *Nature*. <https://doi.org/10.1038/s41586-023-06774-2>

Ferreira, P. P., Conway, L. J., & Cucciari, A. (2023). Search for ambient superconductivity in the Lu–N–H system. *Nature Communications*, 14(1). <https://doi.org/10.1038/s41467-023-41005-2>

Habamahoro, T., Bontke, T., & Chirom, M. (2024). Replication and study of anomalies in LK-99. *Superconductor Science and Technology*, 37(4), 045004. <https://doi.org/10.1088/1361-6668/ad2b78>

Kumar, K., Karn, N. K., & Kumar, Y. (2023). Absence of Superconductivity in LK-99 at Ambient Conditions. *ACS Omega*, 8(44), 41737–41743. <https://doi.org/10.1021/acsomega.3c06096>

Liu, P., Zhuang, Q., & Xu, Q. (2025). Mechanism of high-temperature superconductivity in compressed H<sub>2</sub>-molecular-type hydride. *Science Advances*, 11(13). <https://doi.org/10.1126/sciadv.adt9411>

Minkov, V. S., Ksenofontov, V., & Bud'ko, S. L. (2023). Magnetic flux trapping in hydrogen-rich high-temperature superconductors. *Nature Physics*, 19(9), 1293–1300. <https://doi.org/10.1038/s41567-023-02089-1>

*Nature* Editorial (2024). Retractions are part of science, but misconduct isn't. *Nature*, 628(8009), 689–690. <https://doi.org/10.1038/d41586-024-01174-6>

## Scite + Complex query:

*A patron has this research question:*

*"What is the scholarly state of 'nanoplastic' filtration technology? I also need to find recent EPA or World Health Organization (WHO) technical briefs that discuss the difficulty of setting regulatory standards for these particles."*

*Can you help answer this with Scite?*

I'll search for both aspects of this question in parallel — the filtration technology research and the regulatory standards discussion.

The results are large. Let me extract the key paper metadata from each search.

Now let me get more detail on the most relevant papers and search specifically for WHO/EPA technical documents.

Let me extract the WHO/regulation search results too.

Here's what I found from the scite literature searches, Alfred. I'll break this into the two parts of the patron's question.

---

## Part 1: Scholarly State of Nanoplastic Filtration Technology

The scholarly literature on nanoplastic filtration is active and growing, with several key research threads emerging since 2022:

**Membrane-based approaches** are the most heavily studied. Wan et al. (2022) investigated gravity-driven membrane filtration for removing polystyrene nanoplastic beads, examining mechanisms and effects of different water matrices. This paper has been well-cited (29 Smart Citations, 78 citing publications), suggesting it's become a reference point in the field. [Check for LibKey Access](#)

**Electrospun nanofiber membranes** represent a promising innovation. Juraj et al. (2023) demonstrated polyurethane-based electrospun composite membranes loaded with graphene oxide-montmorillonite for both micro- and nanoplastic separation, achieving high water flux and observing different filtration mechanisms (cake formation, intermediate blocking, standard blocking) depending on polymer type. [Check for LibKey Access](#)

**Conventional drinking water treatment** has also been evaluated. Hofman-Caris et al. (2022) studied coagulation/flocculation/sedimentation and sand/granular activated carbon filtration for removing both inorganic nanoparticles and nanoplastics, finding that biomass presence in sand filters and natural organic matter both contribute to nanoparticle removal. This paper is open access. [Check for LibKey Access](#)

**The most comprehensive recent review** is Chang & Yang (2025) in *Water Environment Research*, which systematically compares four categories of novel materials: renewable biomass-based adsorbents, advanced membrane separation, solar-powered photocatalytic systems, and electrochemical technologies. Their key finding is that removal efficiencies range widely — from 37% to over 99% — and that no single technology provides a complete solution. Traditional methods can perform as low as 48.4% removal. They argue the field needs multifunctional hybrid systems integrated into existing treatment frameworks. [Check for LibKey Access](#)

---

## Part 2: EPA/WHO Technical Briefs on Regulatory Standards

This is where the picture gets murkier, and that's actually the point. Scite's indexed literature is strongest for peer-reviewed journal articles, and **specific EPA or WHO technical briefs on nanoplastic regulation did not surface directly** in these searches. However, the scholarly literature consistently identifies *why* regulatory standards remain elusive:

Zhang et al. (2020), a highly cited review in *Environmental Science & Technology* (392 Smart Citations, 922 citing publications), documented that rigorous analytical methods for detection and characterization of micro- and nanoplastics remain scarce, and knowledge about health effects via dietary and respiratory exposure is limited. This measurement gap is the fundamental obstacle to regulation. [Check for LibKey Access](#)

The detection challenge is also underscored by recent work like Schwaneberg et al. (2025), who developed a novel "MagNanoTrap" enrichment platform precisely because, as they note, the lack of sensitive and universal detection systems hinders regulation.

**For the patron seeking the actual EPA/WHO technical briefs**, I'd recommend:

- The **WHO's 2022 report** "*Dietary and inhalation exposure to nano- and microplastic particles and potential implications for human health*" — this is the most relevant WHO document addressing the difficulty of standard-setting. It's a grey literature/institutional publication that typically wouldn't be fully indexed in scite.
- Searching the **EPA's CompTox Chemicals Dashboard** and their emerging contaminants research pages directly, as EPA technical documents on nanoplastics tend to be published

as agency reports rather than journal articles.

- The journal *Water Emerging Contaminants & Nanoplastics* (which appeared in our results) is worth browsing as a venue specifically dedicated to this intersection.

The patron may also want to check Koelmans et al. (2020) in *PLOS ONE*, a systematic review of microplastic contamination of drinking water (138 Smart Citations), which directly engages with what's needed for regulatory frameworks. [Check for LibKey Access](#)

---

**In short:** The filtration technology literature is robust and growing, with membrane technologies leading the way. The regulatory side remains hampered by the lack of standardized detection methods for particles at the nanoscale — a challenge the scholarly community widely acknowledges. For the actual agency technical briefs, the patron will likely need to go directly to WHO and EPA institutional repositories rather than journal databases.

## References

Chang, Y., & Yang, J. (2025). Novel materials for the removal of microplastics and nanoplastics in drinking water treatment: A comprehensive review. *Water Environment Research*, 98(1).

<https://doi.org/10.1002/wer.70237>

Hofman-Caris, C.H.M., Bäuerlein, P.S.B., & Siegers, W.G. (2022). Removal of nanoparticles (both inorganic nanoparticles and nanoplastics) in drinking water treatment. *Environmental Science: Water Research & Technology*. <https://doi.org/10.1039/d2ew00226d>

Jurajj, K., Ammed, S.P., & Chinglenthoba, C. (2023). Electrospun polyurethane nanofiber membranes for microplastic and nanoplastic separation. *ACS Applied Nano Materials*, 6(6), 4636–4650. <https://doi.org/10.1021/acsnm.3c00112>

Koelmans, A.A., et al. (2020). Microplastic contamination of drinking water: A systematic review. *PLOS ONE*. <https://doi.org/10.1371/journal.pone.0236838>

Wan, H., Shi, K.J., & Yi, Z. (2022). Removal of polystyrene nanoplastic beads using gravity-driven membrane filtration. *Chemical Engineering Journal*, 450, 138484. <https://doi.org/10.1016/j.cej.2022.138484>

Zhang, Q., Xu, E.G., & Li, J. (2020). A review of microplastics in table salt, drinking water, and air: Direct human exposure. *Environmental Science & Technology*, 54(7), 3740–3751. <https://doi.org/10.1021/acs.est.9b04535>

## Cons. + Humanities:

*A patron has this question:*

*"I am exploring the influence of 'Le Jazz Hot' on African American expatriate writers in the 1920s. Which scholars address the 'transatlantic' nature of this movement, and are there specific French police or immigration archives from the period that are now available to researchers?"*

*Can you help answer this with Consensus?*

Great question — let me search Consensus for scholarly work on both the transatlantic jazz/literary movement and the French archival side.

Let me run one more targeted search to round out the literary side.

Here's what Consensus turned up across the two dimensions of this question:

---

### **Scholars on the transatlantic jazz-and-literature movement**

The strongest hit is **R. Gillett, *At Home in Our Sounds* (2021)**, which directly examines Black music in interwar Paris and the communities — African Americans, French Antilleans, and French West Africans — who created and responded to it. Gillett frames jazz as a terrain of cultural politics and traces how music-making brought these groups together while not erasing their national and colonial differences. It's squarely about the transatlantic dimension the patron is after. [Consensus link](#)

**Theresa Leininger-Miller, "New Negro Artists in Paris in the 1920s and 1930s" (2019)** in *The Routledge Companion to African American Art History* discusses the artistic colony in Paris and explicitly names "le jazz hot" as having been imported by African American soldiers during World War I. The focus is more visual art than literature, but it maps the same expatriate milieu. [Consensus link](#)

**S. Ege, "Restaging Respectability" (2022)** in *Angelaki* interweaves the stories of Josephine Baker and Nora Holt to explore African American women's performance lives in jazz-age Paris, situating them between the Harlem and Chicago Black Renaissances and the European reception. [Consensus link](#)

There was also a **2024 Met exhibition review** titled *The Harlem Renaissance and Transatlantic Modernism* published in *Transatlantica* by Kelly-Christina Grant — the title alone confirms this is an active scholarly frame, though Consensus didn't return an abstract. [Consensus link](#)

**Beyond Consensus**, the patron should also know about Tyler Stovall's *Paris Noir: African*

*Americans in the City of Light* and Brent Hayes Edwards' *The Practice of Diaspora: Literature, Translation, and the Rise of Black Internationalism* — both are landmark monographs on exactly this transatlantic literary-musical nexus. Edwards in particular theorizes "décalage" (the gaps and slippages in Black diasporic exchange) using 1920s Paris as a primary site.

---

## French police and immigration archives

This is where the search got really productive. The key work is:

**Clifford Rosenberg, *Policing Paris: The Origins of Modern Immigration Control between the Wars* (2006)** — 83 citations. Rosenberg drew on what he describes as "massive police archives" from the Paris Prefecture of Police to show how interwar French police systematically tracked foreigners by citizenship and national origin. While his focus is broader than African Americans specifically (concentrating heavily on North African colonial workers), the archival infrastructure he used — the Prefecture of Police archives — is the same one that would contain surveillance records on the broader foreign community in 1920s Paris. [Consensus link](#)

**A. Prakash, "Colonial Techniques in the Imperial Capital" (2013)** in *French Historical Studies* 36: 479–510, and the subsequent book **Prakash, *Empire on the Seine* (2022)**, both draw on Prefecture of Police archival records, colonial officials' reports, and housing/social worker records from the 1920s onward. [Check for LibKey Access](#)

---

## Practical guidance on the archives themselves

The patron should know that the relevant French archival holdings are primarily in two places:

1. **Archives de la Préfecture de Police de Paris** (5 rue de la Banque, now relocated) — this is the repository Rosenberg and Prakash used. It holds immigration surveillance files, identity-card registers, and reports on foreign residents. Access policies have varied, but researchers can consult holdings from the interwar period.
2. **Archives Nationales** (Pierrefitte-sur-Seine site) — holds records from the Ministry of the Interior, including immigration policy files and naturalization dossiers from the 1920s.

I'd recommend the patron also look into whether Tyler Stovall or Brent Hayes Edwards discuss specific archival series numbers in their footnotes — that's often the fastest way to identify which *cartons* or *dossiers* within these collections pertain specifically to African Americans rather than the broader immigrant population.

## Cons. + Social sciences:

*A patron has this question:*

*"I've seen conflicting reports on the labor-market effects of UBI. What does the peer-reviewed literature from the Stockton or Finland pilots suggest about 'work disincentives,' and how do these findings differ from popular media portrayals?"*

*Can you answer this with Consensus' help?*

Here's what the peer-reviewed literature says about "work disincentives" from these two major pilots, and how those findings diverge from common media framings.

### **The Finland Experiment (2017–2018)**

Finland's trial randomized 2,000 unemployed benefit recipients to receive €560/month unconditionally. The key finding on employment, from Verho, Hämäläinen & Kanninen (2021), is striking: despite lowering effective tax rates on returning to work by about 23 percentage points and waiving all job-search requirements, days in employment remained statistically unchanged in the first year. Crucially, participation in reemployment services also stayed high — people didn't stop looking for work even when they no longer had to. By the second year of the experiment, a modest positive employment effect did emerge, though the concurrent introduction of Finland's "activation model" (which tightened requirements for all unemployed people) complicates the interpretation.

The broader evaluation by Kangas et al. (2019, 104 citations) and Ylikännö & Kangas (2021) confirmed that the expected "work disincentive" simply did not materialize in the data. What did show up clearly was a wellbeing benefit: Hiilamo & Oberndorfer (2025) found the treatment group had significantly lower odds of mental strain (adjusted OR 0.61), an effect that appeared consistent across demographic subgroups.

[Check for LibKey Access – Verho et al.](#) | [Check for LibKey Access – Hiilamo & Oberndorfer](#)

### **The Stockton SEED Pilot (2019–2021)**

Stockton's experiment gave 131 randomly selected residents \$500/month for two years. West & Castro (2023, 24 citations) published the RCT findings in the *Journal of Urban Health* and reported that recipients experienced lower income volatility, reduced mental distress, better physical functioning, and — importantly — greater agency to pursue new employment and caregiving opportunities. Rather than discouraging work, the guaranteed income appeared to give people the financial stability to take risks like leaving exploitative jobs, pursuing training, or transitioning to better-matched employment. Baker et al. (2020) also documented how the pilot

was carefully designed to avoid triggering the loss of means-tested benefits, which is itself a major disincentive in traditional welfare systems.

[Check for LibKey Access – West & Castro](#) | [Check for LibKey Access – Baker et al.](#)

### **How the peer-reviewed findings differ from popular media portrayals**

The gap between the research and the headlines is substantial. Media coverage — particularly in the early days of the Finland experiment — tended to frame the results as either a clear success or a failure depending on editorial orientation, often reducing the story to "did people work more or not?" The peer-reviewed literature tells a more nuanced story: the feared mass withdrawal from the labor market didn't happen in either pilot; the employment effects were roughly neutral to slightly positive; and the most robust, consistent findings were actually about improved mental health, reduced financial stress, and greater personal agency. As Adkins & Ylöstalo (2020) argue, the Finland experiment needs to be understood as a behavioral intervention aimed at wellbeing, not simply a labor-supply toggle — a framing that most media coverage missed entirely.

A broader review by Csösz (2025) synthesizing evidence across UBI trials (including Finland, Stockton, and Kenya) reaches a similar conclusion: while there are real fiscal concerns about scaling UBI, the labor market participation fears that dominate public discourse are largely unsupported by the experimental evidence. Cabrales, Hernández & Sánchez (2020, 14 citations) even found in a controlled lab experiment that providing a basic income of roughly one-fifth of median wages had no effect on worker effort.

**Caveats worth flagging for your patron:** Both pilots had limitations. Finland's sample was restricted to unemployed benefit recipients (not the general population), and the payment was relatively modest. Stockton's sample was small (n=131 treated) and geographically specific. Neither pilot is a perfect test of a universal, permanent, national-scale UBI. The literature is honest about this, even as it consistently fails to find the dramatic work disincentives that critics predict.

**Cons. + STEM:**

*A patron has this research question:*

*"What is the current state of research regarding 'in situ' carbon mineralization in basaltic rocks (like the CarbFix project)? Who are the key geochemists leading this field, and what are the major technical hurdles identified in the 2024-2025 literature?"*

*Can you help answer this with Consensus?*

I'll search Consensus from multiple angles to build a comprehensive answer. Let me run several queries in parallel.

Good results. Let me also search for the key researchers specifically, and for the pore-clogging/scaling challenge that's a known hurdle.

Here's a synthesis for your patron based on the Consensus results:

---

## **Current State of In Situ Carbon Mineralization in Basaltic Rocks**

**Overview of the field:** The 2024–2025 literature shows this area is maturing rapidly. The foundational proof-of-concept has been established — the CarbFix projects at Hellisheidi, Iceland, and the Wallula Basalt Pilot in Washington State demonstrated that injected CO<sub>2</sub> can mineralize into stable carbonates within just 2–4 years, far faster than originally expected. However, a 2025 IEAGHG-commissioned review (Schaef, Bartels, et al.) notes that total injected CO<sub>2</sub> through subsurface mineralization worldwide still stands at only about 100,000 tonnes, overwhelmingly from CarbFix, even as theoretical storage resource estimates range into the gigatons-to-teratons. The gap between demonstrated scale and climate-relevant scale is the central tension in the field right now.

**Key researchers:** The names that appear most consistently in the Consensus results are:

- **Sigurður R. Gíslason** (University of Iceland) — co-founder of the CarbFix approach; continues publishing actively on basalt weathering and CO<sub>2</sub>–water–rock interactions (2024–2025 papers in *Chemical Geology*, *Geochimica et Cosmochimica Acta*).
- **Eric H. Oelkers** (CNRS Toulouse / University of Iceland) — Gíslason's long-time collaborator; co-authored the 2023 *Geochemical Perspectives* monograph "Carbon Capture and Storage: From Global Cycles to Global Solutions," which is a comprehensive history and technical assessment of the CarbFix approach (22 citations already).

- **Herbert Todd Schaef** and **Quin R. S. Miller** (Pacific Northwest National Laboratory) — leading the U.S. side of basalt carbonation research, including reactive transport modeling of the Columbia River Basalt Group.
- **David S. Goldberg** (Columbia University / Lamont-Doherty) — working on offshore basalt mineralization and water-alternating-gas (WAG) injection strategies.
- **Benjamin Tutolo** and **Adedapo Noah Awolayo** (University of Calgary) — reactive transport modeling of WAG injection in submarine basaltic aquifers (Cascadia Basin); their 2025 *Fuel* paper already has 6 citations.
- **Sandra Ó. Snæbjörnsdóttir** — a key CarbFix team member (though her name appeared less in these specific result sets, she is widely recognized as a leading figure in CarbFix field operations and monitoring).

### Major technical hurdles identified in 2024–2025:

1. **Permeability reduction and pore clogging.** This is arguably the single biggest concern. Nishiyama et al. (2025, *JGR: Solid Earth*) showed that CO<sub>2</sub>–water–basalt interaction at 200°C reduced permeability by up to two orders of magnitude, driven not by carbonate precipitation but by phyllosilicate coatings clogging pore throats. Akanji et al. (2025, *Advances in Colloid and Interface Science*) also investigated pore network changes during in situ mineralization. The paradox is that successful mineralization can seal the very pathways needed for continued injection.
2. **Scaling from dissolved-phase to gigaton-per-year injection.** The CarbFix method dissolves CO<sub>2</sub> in water before injection, which accelerates mineralization but requires enormous volumes of water. Awolayo, Tutolo et al. (2025) and Nelson, Goldberg et al. (2025) both explore water-alternating-gas (WAG) injection as a compromise — their models show WAG can improve mineralization by ~20% over supercritical CO<sub>2</sub> alone while using half the water of a fully dissolved approach. But the economics of WAG, particularly offshore, remain challenging.
3. **Water demand.** Demirer et al. (2023) note that freshwater requirements are a fundamental constraint and explore seawater as an alternative carrier fluid — but seawater's high ionic strength makes the geochemistry more complex and less predictable.
4. **Site characterization and heterogeneity.** Mwakipunda et al. (2024, *Geoenergy Science and Engineering*, 9 citations) flag site selection, storage capacity estimation, well integrity, and the strong dependence of geochemical reaction rates on local formation properties as persistent challenges.
5. **Reactive transport modeling speed.** Demirer, Abarca et al. (2023) are developing

machine-learning surrogates for geochemical solvers within reactive transport models, achieving ~30× speedups — necessary because full-physics simulations of mineralization over kilometer-scale domains are computationally prohibitive.

6. **Monitoring, reporting, and verification (MRV).** The Schaefer et al. (2025) IEAGHG review emphasizes that regulators and investors need better tools for verifying that mineralization has actually occurred at depth, which remains difficult.

---

**Selected references with access links:**

- Oelkers & Gíslason (2023). "Carbon Capture and Storage: From Global Cycles to Global Solutions." *Geochemical Perspectives*. [Consensus link](#)
- Mwakipunda et al. (2024). "A review on carbon dioxide sequestration potentiality in basaltic rocks." *Geoenergy Science and Engineering*. [Consensus link](#)
- Owusu et al. (2025). "Carbon Mineralization in Basaltic Rocks: Mechanisms, Applications, and Prospects." *Energies*. [Consensus link](#)
- Awolayo, Tutolo et al. (2025). "Water-Alternating-Gas (WAG) injection scheme for enhancement of CO<sub>2</sub> mineralization in basaltic aquifers." *Fuel*. [Consensus link](#)
- Nelson, Goldberg & White (2025). "Water-alternating-gas injections for optimized mineral carbon storage in basalt." *Int. J. Greenhouse Gas Control*. [Consensus link](#)
- Nishiyama et al. (2025). "Changes in Permeability and Pore Structure Induced by CO<sub>2</sub>-Water-Basalt Interaction." *JGR: Solid Earth* 130. [Consensus link](#)
- Schaefer, Bartels et al. (2025). "Review of CO<sub>2</sub> storage via in-situ mineralisation in mafic-ultramafic rocks." (IEAGHG report). [Consensus link](#)
- Linke, Oelkers, Gíslason et al. (2024). "The geochemical evolution of basalt Enhanced Rock Weathering systems." *Geochimica et Cosmochimica Acta*. [Consensus link](#)

## Cons. + Complex query:

*A patron has this research question:*

*"I am investigating the 'carbon neutrality' claims of Cross-Laminated Timber (CLT) for high-rise buildings. What does the lifecycle analysis (LCA) literature say, and are there building code reports or forestry management white papers that challenge the 'sustainable' narrative?"*

*Can you answer this?*

Great question — this touches on a genuinely contested area in sustainable construction research. Let me search across a few sources to give you a well-rounded answer. This is an excellent and timely research question. Here's what I found across the peer-reviewed LCA literature, building code reports, and critical forestry perspectives.

---

## What the LCA Literature Generally Shows

The majority of comparative LCA studies find that CLT buildings have meaningfully lower embodied carbon than functionally equivalent concrete and steel structures. Younis & Dodoo (2022), in an overview of a decade of LCA studies, reported an average 40% reduction in carbon footprint for CLT multi-story buildings compared to steel/concrete. Similarly, Jayalath et al. (2020) found 29–34% reductions in lifecycle greenhouse gas emissions for CLT mid-rise buildings across three Australian cities. Andersen, Rasmussen & Ryberg (2021) found CLT had the lowest impact in 11 of 18 environmental impact categories in a comparison with concrete, though they noted that operational energy — not structural material choice — was the dominant lifecycle contributor.

These studies generally support the idea that CLT is *lower-carbon* than conventional materials, but that framing is importantly different from "carbon neutral."

### Key references:

- Younis & Dodoo (2022), *Journal of Building Engineering* — [Check for LibKey Access](#)
  - Andersen, Rasmussen & Ryberg (2021), *Energy and Buildings* — [Check for LibKey Access](#)
  - Jayalath et al. (2020), *Energy and Buildings* 223, 110091 — [Check for LibKey Access](#)
-

# The Major Critiques

## 1. Forest Carbon Opportunity Costs

This is arguably the most significant challenge to the CLT sustainability narrative. Peng, Searchinger, Zions & Waite (2023), published in *Nature*, modeled the carbon costs of global wood harvests and found annualized costs of 3.5–4.2 Gt CO<sub>2</sub>e/yr between 2010 and 2050 — approaching estimates for land-use change from agricultural expansion. Their core argument is that many accounting frameworks inappropriately credit new harvests with carbon sequestration that would have occurred regardless (from agricultural abandonment, recovery from prior harvests, and climate-driven growth). — [Check for LibKey Access](#)

Maierhofer et al. (2024), in *Sustainable Production and Consumption*, directly applied this logic to buildings. They found that when carbon opportunity costs are included — i.e., the carbon that forests would have stored if left unharvested — no wooden building scenario in their case study achieved sufficient GHG substitution to compensate for the unrealized forest carbon storage. — [Check for LibKey Access](#)

## 2. The WRI Position

The World Resources Institute has been particularly vocal. Their analysis of over 60 papers found that nearly all studies claiming climate benefits from wood use excluded key emissions based on the assumption that sustainably harvested wood is carbon-neutral. WRI argued that using wood in construction may actually increase net emissions for many decades relative to concrete and steel, once the forgone forest carbon sequestration is factored in. — [WRI Analysis](#)

It's worth noting this position is itself contested. Ohio State's Global Forests program has published a direct rebuttal arguing that WRI's no-harvest counterfactual is the wrong baseline for carbon accounting in managed forests. — [OSU Rebuttal](#)

## 3. Biogenic Carbon Accounting Inconsistencies

A recurring finding across the literature is that LCA results for mass timber vary enormously depending on methodology. At the material level, reported emissions range from –687 to +1,718 kg CO<sub>2</sub>e/m<sup>3</sup>, largely driven by how biogenic carbon flows are treated, where system boundaries are drawn, and what end-of-life scenarios are assumed. Only about 35% of a harvested tree makes it into the building, and the fate of the rest — slash, sawmill residues, short-lived products — is often poorly accounted for.

## 4. End-of-Life Assumptions

Most current CLT buildings are not designed for timber reuse after demolition, meaning

incineration is the likely end-of-life pathway, which releases stored carbon. Studies that assume long-term carbon storage in timber products without accounting for this are arguably overstating benefits.

## 5. Scalability Concerns

Gingrich et al. (2025), in *iScience*, modeled the global option space for wood in buildings through 2050 and concluded that substantially increasing wood intensity in construction within ecological limits is only feasible under a low-floorspace, high-circularity scenario — a finding that should temper enthusiasm about mass timber as a universal solution.

---

## Building Code and Fire Safety Dimension

The 2021 and 2024 International Building Code (IBC) introduced three new construction types (IV-A, IV-B, IV-C) allowing mass timber buildings up to 18 stories. Key concerns flagged in recent reports include: fire protection of connections, the adequacy of charring-based fire resistance design for full burnout scenarios, timber's contribution to fire load in tall buildings, and heavy reliance on sprinkler systems. Notable reports include Arup's *Fire Safe Design of Mass Timber Buildings* (2024), the NFPA Fire Protection Research Foundation's gap analyses, and the World Steel Association's *Timber High Rise Buildings and Fire Safety* report.

- [Arup Guide \(2024\)](#)
  - [NFPA Gap Analysis](#)
  - [MDPI Fire Journal — Contemporary Fire Safety Engineering in Timber Structures \(2024\)](#)
- 

## Bottom Line for the Patron

The LCA literature consistently shows CLT has lower embodied carbon than concrete/steel — but "carbon neutral" is a different and much stronger claim that the evidence does not clearly support. The strongest critiques come from forest carbon opportunity cost analyses (Peng et al. in *Nature*, Maierhofer et al., and WRI's work), which argue that many LCAs omit the carbon forests would have sequestered if not harvested. Biogenic carbon accounting remains methodologically fractured, end-of-life assumptions are often optimistic, and scalability is constrained by ecological limits. Meanwhile, building codes are adapting but fire safety knowledge gaps remain, particularly for the tallest mass timber structures.

This is an active and genuinely contested debate, not a settled one.

Sources:

- [Peng et al. \(2023\), \*Nature\*](#)
- [WRI — Analyzing Mass Timber's Climate Impact](#)
- [WRI — Harvesting Wood Has Overlooked Carbon Costs](#)
- [OSU Global Forests — Rebuttal to WRI](#)
- [Corgan — Understanding Real CO<sub>2</sub>e Emissions in Mass Timber Production](#)
- [Gingrich et al. \(2025\), \*iScience\*](#)
- [Nature Communications \(2025\) — Global Land and Carbon Consequences of Mass Timber](#)
- [Arup — Fire Safe Design of Mass Timber Buildings \(2024\)](#)
- [NFPA — Mass Timber Structures Postfire Gap Analysis](#)

## Homebrew + Humanities:

*I have a patron researching the social fluidities of the Texas-Mexico border during the mid-19th century. What are the key historiographical debates regarding 'identity' in this region, and which digital archives hold the most significant collections of personal correspondence from this era?*

### [PHASE 1: QUERY ANALYSIS]

## Research Plan

**Query type:** mixed (breadth-dominant for historiographical debates + relation-dominant for tracing specific digital archive collections)

**Complexity:** moderate

**Question interpreted as:** Two intertwined sub-questions: (1) What are the major historiographical debates about identity — racial, ethnic, national, class — in the Texas-Mexico borderlands during roughly the 1840s–1860s? (2) Which digitized archival collections hold significant personal correspondence (letters, diaries, family papers) from this era and region?

### Knowledge types needed:

- Peer-reviewed research: 3 — essential for mapping historiographical debates
- Books/monographs: 3 — borderlands historiography is heavily monograph-driven (Anzaldúa, Weber, Truett, De León, etc.)
- Gray literature: 1 — archival finding aids and collection descriptions
- Government/official: 1 — some relevant collections sit in state/federal repositories (NARA, Texas State Library)
- Dissertations: 1 — may reveal emerging debates not yet in monographs
- Trade/professional press: 0

### Search strategy:

1. **OpenAlex semantic:** "historiographical debates about identity in the Texas-Mexico borderlands mid-nineteenth century" — 10 results
2. **OpenAlex keyword:** "borderlands identity" + "Texas Mexico" + 19th century — 10 results
3. **Academic search keyword:** "Tejano identity" OR "Mexican American identity" + historiography — 10 results

4. **Web search:** digital archives + personal correspondence + Texas-Mexico border + 19th century — targeted searches for specific repositories (Dolph Briscoe Center, Benson Latin American Collection, Portal to Texas History, etc.)
5. **Chester Fritz Library:** check local holdings on borderlands historiography

**Estimated scope:** 15–25 sources (split between scholarly works and archive/collection descriptions)

**Output format:** Markdown (narrative synthesis with embedded citations and archive descriptions; will offer .docx conversion after review)

**Quality signals to prioritize:**

1. **Source authority** — foundational monographs and major historiographical essays
2. **Citation count** — identifying the field-defining works
3. **Recency** — newer interventions (transnational turn, gender/sexuality in borderlands studies)

Does this approach make sense? A few clarifying questions before I search:

- **Temporal scope:** I'm assuming roughly 1840s–1860s (Mexican-American War through early Reconstruction). Should I widen to include the 1830s Texas Revolution period or extend into the 1870s?
- **Identity dimensions:** The historiography covers racial, ethnic, national, class, and gendered identity. Should I weight any of these more heavily, or cast a wide net?
- **Depth on archives:** Should I focus on freely accessible digital collections, or also include institutionally restricted ones that your patron might request through ILL or a visit?

*I'd extend this to the Texas Revolution and take it to 1872. Cast a wide net as to identity. We're open to where this goes. We're willing to look into travel grants, so if there are restricted ones that look promising, do mention those*

Great — I'll widen the window to 1830–1872 and keep identity broadly defined. Let me start searching.

Good first pass — strong results on national identity and historiographical framing. Let me continue with keyword searches.

Some useful finds there — Mareite on self-liberated slaves, Starling on Catholic marriage and border-making, Tracy on "Mexicanization." Let me now search for the key monographs and historiographical essays, then pivot to digital archives.

Excellent — this is filling out the historiographical picture nicely. Now let me search specifically for digital archives and personal correspondence collections.

## [PHASE 2: DISCOVERY — Results]

I've completed four rounds of searching. Here's a summary before I synthesize:

**Searches completed:** 6 (2 semantic, 1 keyword, 2 web, 1 CFL catalog) **Candidates found:** ~25 unique items across scholarship and archives

### By category:

- Historiographical scholarship (monographs & articles): ~15 items
- Digital archive collections identified: ~10 distinct repositories
- CFL holdings with online access: 3–4 titles (notably Valerio-Jiménez's *River of Hope* is available online through CFL)

### Key finds so far:

- **Reséndez** (*Changing National Identities at the Frontier*) — the landmark study on shifting national identity, 1800–1850
- **Valerio-Jiménez** (*River of Hope*) — identity and nation-building in the Lower Rio Grande, available through CFL
- **Lim** (*Porous Borders*) — multiracial identity formation at the border
- **Vila** (*Border Identifications*) — challenges hybridity narratives with ethnographic evidence on religion, gender, class
- **Poyo & Hinojosa** (1988) — foundational historiographical essay on Spanish Texas
- **Gutiérrez & Young** — "Transnationalizing Borderlands History," key methodological piece
- **Mareite** — self-liberated slaves and asylum in northeastern Mexico, 1803–1836
- **Starling** — Catholic marriage and border-making in Paso del Norte
- **Kinnally** (*Forgotten Futures*) — transnational collaboration between Mexican and Anglo elites

**Archives:** Briscoe Center, Benson Latin American Collection, Portal to Texas History, UT Arlington, Library of Congress Mexican War collections, Bexar County Spanish Archives, University of Houston Mexico Documents, and the AGN (Mexico) — with varying degrees of digitization.

**Gaps I notice:** I haven't yet surfaced Arnoldo De León's work on Tejano community, David Montejano's *Anglos and Mexicans in the Making of Texas*, or the Sánchez Navarro papers at the Benson (75,000 pages of northern Mexican family papers). These are well-known enough that I can include them from domain knowledge without risking fabrication.

Should I proceed to the full synthesis, or would you like me to search any particular thread more deeply — for instance, more on the slavery/freedom dimension of border identity, or indigenous

borderlands crossings?

*I think those two threads could be key--definitely two areas where the "border" might have very contextual as well as legal meaning. Investigate those two, and then pull it all together*

Both threads are very productive. Let me get one more targeted search for the Comanchería scholarship (Hämäläinen, DeLay) and for archives specific to the slavery/freedom thread, then I'll synthesize.

Now let me pull everything together into a coherent synthesis.

I have strong results across all threads — let me compose the final output.

---

## **Historiographical Debates on Identity in the Texas-Mexico Borderlands, 1830–1872**

### **I. The Major Debates**

The historiography of identity in this region clusters around several overlapping — and sometimes competing — frameworks. Here are the principal fault lines.

#### **1. National Identity as Process, Not Category**

The most influential intervention of the last two decades is Andrés Reséndez's argument, developed in his 1999 *Journal of American History* article and his 2005 monograph *Changing National Identities at the Frontier*, that residents of the borderlands did not arrive with fixed national identities. Instead, people in Texas and New Mexico adopted, shed, and recombined Mexican, American, and regional identities strategically in response to commerce, governance, and violence. This reframed identity as something performed and negotiated rather than inherited — a position that has become the baseline for most subsequent work.

- Reséndez, "National Identity on a Shifting Border" (1999). [Check for LibKey Access](#)
- Reséndez, *Changing National Identities at the Frontier* (2005). [Check for LibKey Access](#) (review)

#### **2. Identity Formation in the Lower Rio Grande**

Omar Valerio-Jiménez's *River of Hope: Forging Identity and Nation in the Rio Grande Borderlands* (2013) examines how residents of the Lower Rio Grande used legal categories — citizenship, property rights, marriage — to construct and contest identities across multiple sovereignties (Spanish, Mexican, Texan, U.S.). He shows how categories like "Mexican,"

"Texan," and "American" were actively forged through encounters with the state rather than preexisting the border. This is **available online through Chester Fritz Library**.

- Valerio-Jiménez, *River of Hope* (2013). [Check for LibKey Access](#)

### **3. Against Hybridity: The Vila Critique**

Pablo Vila's *Border Identifications* (2005) and his 2003 literature review push back hard against the "border crossing" and hybridity paradigms associated with Gloria Anzaldúa and Renato Rosaldo. Based on ethnographic evidence, Vila argues that borderlanders often reinforce rather than dissolve boundaries, and that religion, gender, and class produce sharp internal differentiations that the hybridity framework obscures. This debate — hybridity vs. reinforcement — remains one of the most active in the field.

- Vila, "Processes of identification on the U.S.-Mexico border" (2003). [Check for LibKey Access](#)
- Vila, *Border Identifications* (2005). [Check for LibKey Access](#)

### **4. The Transnational Turn**

Gutiérrez and Young's "Transnationalizing Borderlands History" (2010) traces how the field has moved from Bolton's "Spanish Borderlands," through Chicano Studies' reclamation of Aztlán, to Anzaldúa's metaphorical *Borderlands/La Frontera*, and finally toward a transnational framework that treats the border region as constitutive of both nations rather than marginal to either. The essay is essential reading for understanding how the field's own identity has shifted.

- Gutiérrez & Young, "Transnationalizing Borderlands History" (2010). [Check for LibKey Access](#)

### **5. Gender and the Borderlands**

Monica Perales's 2013 retrospective on Anzaldúa's legacy traces 25 years of scholarship on how gender and sexuality structured power in the borderlands. Antonia Castañeda's 1990 article on Spanish-Mexican women in frontier California historiography, while focused on California, established methodological precedents used heavily by Texas borderlands scholars. Jamie Starling's work on Catholic marriage in Paso del Norte shows how the Church governed family formation and thus racial and national belonging until the 1860s–70s — making the sacramental record a site of identity construction.

- Perales, "On Borderlands/La Frontera" (2013). [Check for LibKey Access](#)
- Castañeda, "Gender, Race, and Culture" (1990). [Check for LibKey Access](#)

### **6. Slavery, Freedom, and the "Line of Liberty"**

This is a rapidly growing subfield. Alice Baumgartner's *South to Freedom* (2020) has become the major synthesis, arguing that fugitive flight southward shaped the sectional crisis as much as the better-known Underground Railroad. James Nichols's 2013 article "The Line of Liberty" makes a crucial paired argument: runaway slaves fled south while Mexican debt peons fled north, and the border meant opposite things to each group. Nichols also complicates the "line of freedom" narrative by showing that northern Tamaulipas was itself a violent, unstable space where freedom was far from guaranteed. Mekala Audain's dissertation *Mexican Canaan* (2014) traces how enslaved people learned about Mexican abolition and constructed escape networks — a story about the circulation of knowledge and the social construction of "freedom" as a geographically located possibility.

- Nichols, "The Line of Liberty" (2013). [Check for LibKey Access](#)
- Baumgartner, *South to Freedom* (2020). [Check for LibKey Access](#) (review)
- Audain, *Mexican Canaan* (dissertation, 2014). [Check for LibKey Access](#)
- Cornell, "Citizens of Nowhere" (2013). [Check for LibKey Access](#)
- Tyler, "Fugitive Slaves in Mexico" (1972). [Check for LibKey Access](#)

## 7. Indigenous Sovereignty and the Irrelevance of the Border

For Comanche and Apache peoples, the 1848 border was an irrelevance imposed on top of existing territorial and diplomatic systems. Pekka Hämäläinen's *The Comanche Empire* (2008) — which I can confirm from domain knowledge as one of the most cited works in the field — reframed the Comanchería as an imperial polity that dominated the southern plains and northern Mexico throughout this period. Brian DeLay's *War of a Thousand Deserts* (2008) argues that Comanche and Apache raiding into northern Mexico was a decisive factor in Mexican state weakness that made the U.S. conquest possible. Jeffrey Schulze's *Are We Not Foreigners Here?* (2018) examines how indigenous peoples on the border developed their own nationalist responses, and Marcela Terrazas y Basante's work shows how Indian raids shaped competing Mexican and American claims to sovereignty.

- Schulze, *Are We Not Foreigners Here?* (2018). [Check for LibKey Access](#)
- Terrazas y Basante, "Indian Raids in Northern Mexico" (2020). [Check for LibKey Access](#)
- Schlereth, "Privileges of Locomotion" (2014). [Check for LibKey Access](#)
- Arreola, "Chiricahua Apache Homeland in the Borderland Southwest" (2012). [Check for LibKey Access](#)

## 8. Foundational Historiographical Essays

For a patron entering this field, two older essays map the terrain. Poyo and Hinojosa's 1988 "Spanish Texas and Borderlands Historiography in Transition" traces how the field moved beyond Bolton, and the Oxford Bibliographies entry on "History of the U.S.-Mexico Border" (2013) provides a structured overview of the whole field.

- Poyo & Hinojosa (1988). [Check for LibKey Access](#)
- 

## II. Digital Archives with Significant Personal Correspondence

### Tier 1: Major Digitized Collections (freely accessible)

- [Portal to Texas History](#) — The broadest gateway. Aggregates materials from hundreds of Texas institutions. Search for personal papers, letters, and diaries from the 1830s–1870s. Includes county records, newspapers, and family collections.
- [Bexar Archives](#) (Briscoe Center for American History, UT Austin) — ~300,000 pages of manuscript material from Spanish and Mexican Texas. Digitized and searchable. Strong for the 1830s transition period.
- [Bexar County Spanish Archives](#) — Personal papers of figures like Manuel Yturri Castillo (1789–1843), including correspondence, contracts, and probate documents. Digitally imaged.
- [A Continent Divided: The U.S.-Mexico War](#) (UT Arlington) — Letters, diaries, proclamations, maps, and images from the Mexican-American War period. Strong on the military experience but includes personal correspondence.
- [Library of Congress Mexican War Digital Collections](#) — Includes the papers of Ulysses S. Grant (~50,000 items) and Zachary Taylor (~650 items), with personal and family correspondence from the war period.
- [Briscoe Center Slavery Resources](#) (UT Austin) — Finding aids and some digitized materials related to slavery in Texas, including plantation records and correspondence that document the fugitive slave issue.

### Tier 2: Significant but Partially Digitized or Restricted (worth a travel grant)

- [Sánchez Navarro Family Papers](#) (Benson Latin American Collection, UT Austin) — ~75,000 pages of a prominent northern Mexican family's papers, rich in socioeconomic data on Coahuila and the border region. A major trove for understanding Mexican elite perspectives on the border. Not fully digitized; physical visit or ILL for specific items.
- [LLILAS Benson Digital Collections](#) (UT Austin) — The Benson Latin American Collection's digitized holdings, which include selected materials from larger archival

collections. The gateway to checking what from the Benson's massive holdings is available remotely.

- **Mexico Documents Collection** (University of Houston) — 162 documents of personal and official correspondence, government orders, and decrees. Partially digitized.
- **Institute of Oral History** (UT El Paso) — While focused on the 20th century, some collections include family papers and retrospective accounts that reach back into the 19th century for the El Paso–Ciudad Juárez corridor.
- **Archivo General de la Nación (AGN), Mexico City** — The essential counterpart for any serious borderlands project. Northern Mexican correspondence, military records, and governance documents are housed here. Increasingly digitized through Mexico's national digitization efforts, but a research trip remains necessary for deep work.

### **Tier 3: Broader Databases with Relevant Content**

- **North American Women's Letters and Diaries** (Alexander Street Press, accessible through many academic libraries) — Letters and diaries from 1700–1950; searchable for Texas and border content.
- **American Civil War: Letters and Diaries** (Alexander Street Press) — ~100,000 pages of correspondence and memoirs; relevant for the 1861–1872 end of your patron's period.

---

## **III. Practical Recommendations for Your Patron**

The two threads you flagged — slavery/freedom and indigenous sovereignty — are where the most exciting recent work is happening, and they intersect in productive ways. The border meant something fundamentally different depending on who was crossing it: a line of liberty for enslaved people, a line of dispossession for Comanche and Apache peoples, a line of opportunity or loss for Tejano families, and an administrative fiction for the Catholic Church that continued to marry and baptize across it. A project on "social fluidities" is well positioned to put these experiences in conversation.

For archival work, the Benson Latin American Collection (especially the Sánchez Navarro papers) and the Briscoe Center at UT Austin are the two indispensable stops for a research trip. Both are in Austin, making a single travel grant application feasible. The AGN in Mexico City would be the logical second trip for the Mexican-side correspondence.

Shall I export any of these citations to Zotero, or compile this into a Word document your patron could take with them?

## Homebrew + Social Sciences:

*A patron came to me with a question:*

*"There is significant scholarly disagreement regarding the scalability and efficacy of 'growth mindset' interventions in K-12 education. What does the most recent meta-analysis say, and how do critics like Timothy Bates frame their counter-arguments?"*

*Can you help?*

### [PHASE 1: QUERY ANALYSIS]

## Research Plan

**Query type:** mixed (breadth across the meta-analytic literature + relational traversal of Timothy Bates's specific critiques)

**Complexity:** moderate

**Question interpreted as:** The patron wants to understand (1) what the most recent meta-analysis concludes about growth mindset interventions in K-12 settings, and (2) how skeptics — particularly Timothy Bates — have framed their counter-arguments regarding scalability and effect sizes.

### **Knowledge types needed:**

- Peer-reviewed research: 3 — essential; meta-analyses, replication studies, and Bates's published critiques are the core of this question
- Preprints/working papers: 1 — growth mindset debate has played out partly in preprints
- Trade/professional press: 1 — useful for practitioner framing of the debate
- Books/monographs: 1 — Dweck's foundational work for context
- Gray literature: 0 — not central here
- Government/official: 0 — not relevant

### **Search strategy:**

1. **Academic search (semantic):** "efficacy of growth mindset interventions in K-12 education meta-analysis" — 10 results, prioritizing recency and citation count
2. **Academic search (keyword):** "growth mindset" + "meta-analysis" — 10 results to catch what semantic misses
3. **Author lookup:** Timothy Bates — retrieve his publications on growth mindset replication failures

4. **Web search:** for any very recent commentary or debate (2024–2026) not yet indexed in academic databases

**Estimated scope:** 12–20 sources **Output format:** Markdown synthesis with annotated references (will offer .docx or Zotero export after review)

**Quality signals to prioritize:**

1. **Methodological rigor** — meta-analyses, systematic reviews, pre-registered replications
2. **Recency** — most recent meta-analysis is the focal point
3. **Author expertise** — Dweck, Yeager, Bates, and other key voices in this debate

Does this approach look right? Should I weight the critic side more heavily, or do you want balanced coverage of both proponents and skeptics?

*I think that's good. We're mostly focused on what the current state of the academic discussion, so both the critics and the response*

Great — balanced coverage it is. Let me start searching.

Good — the semantic search returned strong results. The keyword search was mostly noise, so I'll discard it. I can see two competing 2022 meta-analyses already (Burnette et al. and Macnamara & Burgoyne), which is likely the crux of the debate. Let me now search for Bates's work and check for anything more recent.

The academic databases aren't surfacing Bates's papers directly. Let me try more targeted approaches.

Excellent — now I have a clear picture of Bates's work. Let me get the specific DOIs for his key paper and check for the very latest publications.

I found a 2025 structured review (Gazmuri) and an important 2023 commentary by Yeager & Dweck responding to the competing meta-analyses. Let me grab those final pieces.

Let me try the PMC link directly to get the right DOI for the Tipton et al. commentary.

Now I also see a reply from Macnamara & Burgoyne to that commentary. Let me grab one more piece — the Li & Bates paper details.

Now I have all the key pieces. Let me also check for Sisk et al. (2018) — the earlier Macnamara-led meta-analysis — and then synthesize.

Here's what I've found for your patron. This is a genuinely active scholarly debate, and the literature clusters nicely into a few key threads.

---

## The State of the Growth Mindset Debate

## The Two Competing 2022 Meta-Analyses

The most important recent development is that *Psychological Bulletin* published two dueling meta-analyses in the same volume, reaching different conclusions from largely the same literature:

**Macnamara & Burgoyne (2022)** took a skeptical approach, finding that growth mindset interventions had a small overall effect on academic achievement that became non-significant after correcting for publication bias. Even when restricting to studies that confirmed the intervention actually changed students' mindsets, the effect was non-significant. They flagged widespread shortcomings in study design, analysis, and reporting. [Check for LibKey Access](#)

**Burnette, Billingsley, Banks, et al. (2022)** used a heterogeneity-focused approach and found positive effects on academic outcomes, mental health, and social functioning — but emphasized that effects are highly variable across contexts. Interventions tended to work better for specific subpopulations (e.g., academically at-risk students) and in specific delivery contexts. [Check for LibKey Access](#)

## The Heterogeneity Commentary

**Tipton, Bryan, Murray, McDaniel, Schneider, & Yeager (2023)** published a commentary in *Psychological Bulletin* arguing that the yes-or-no framing ("do growth mindset interventions work?") is the wrong question entirely. They advocate for a heterogeneity-attuned approach that asks *where, for whom, and under what conditions* effects emerge. They contend that Macnamara & Burgoyne's approach obscures meaningful variation. [Check for LibKey Access](#)

Macnamara & Burgoyne published a reply to this commentary, maintaining their position that the evidence, taken as a whole, shows effects are likely attributable to inadequate study design and bias.

## Timothy Bates's Critique

Bates's most important contribution is **Li & Bates (2019)** in *Journal of Experimental Psychology: General*, which attempted a close replication of Mueller & Dweck's (1998) foundational study with Chinese schoolchildren aged 9–13 ( $n = 624$ ). Across three experiments, they found one barely significant result on the key manipulation ( $p = .049$  in Study 1), null results in Studies 2 and 3, and no effects on any of the eight motivation and attribution measures from the original. Most strikingly, one study found a significant effect in the *opposite* direction of what mindset theory predicts. They also found no association between children's mindsets and their school grades across a semester. [Check for LibKey Access](#)

Bates's broader critique, as articulated in public commentary, centers on three points: (1) the

original effect sizes claimed by Dweck were implausibly large; (2) the real-world effects found in large-scale studies (like Yeager et al. 2019 in *Nature*) are what most people would consider trivially small (around 0.1 GPA points); and (3) the theory has had an outsized influence on teaching practice relative to the strength of the evidence.

## The Proponent Response

**Yeager & Dweck (2020)** in *American Psychologist* addressed the controversies directly, arguing that growth mindset effects are real but context-dependent, that failed replications often didn't create the right psychological conditions, and that even small effect sizes from brief, scalable interventions are practically meaningful at the population level. [Check for LibKey Access](#)

The large-scale **Yeager et al. (2019)** study in *Nature* — a pre-registered national experiment with U.S. 9th graders — found that a brief online growth mindset intervention improved grades among lower-achieving students, particularly in schools with supportive peer norms. The overall effect was modest but statistically significant. [Check for LibKey Access](#)

## The Most Recent Work

**Gazmuri (2025)**, in a structured review of 24 RCTs, concluded that the evidence for growth mindset interventions improving academic achievement remains weak and inconsistent, aligning more with the skeptical reading. [Check for LibKey Access](#)

**Bardach, Bostwick, Fütterer, et al. (2024)** published a meta-analysis specifically on *teachers'* growth mindset, finding it was related to teacher self-efficacy but not significantly related to student achievement. [Check for LibKey Access](#)

## Earlier Foundational Meta-Analysis

**Sisk, Burgoyne, Sun, Butler, & Macnamara (2018)** in *Psychological Science* published two earlier meta-analyses finding weak relationships between growth mindset and academic achievement, and small effects of growth mindset interventions overall, with some benefits for economically disadvantaged or academically at-risk students. [Check for LibKey Access](#)

---

## Summary for Your Patron

The short answer is: the field is genuinely split. The most recent meta-analyses (both from 2022, with ongoing commentary through 2023 and a 2025 structured review) disagree not just on conclusions but on the proper *methodology* for evaluating these interventions. Skeptics like Bates and Macnamara argue that the evidence, once corrected for bias and design flaws, shows

negligible or null effects. Proponents like Yeager and Dweck argue that averaging across heterogeneous contexts masks real effects that emerge under specific conditions — and that even small effects from cheap, scalable interventions matter at population scale. The 2025 Gazmuri review leans toward the skeptical side.

This is a live debate, and the methodological disagreement (heterogeneity-attuned vs. traditional meta-analysis) is itself an interesting dimension your patron may want to flag. Would you like me to export any of these references to your Zotero library, check CFL holdings, or compile this as a document to hand the patron?

## Homebrew + STEM:

*I have another patron reference question:*

*"What is the current consensus on overcoming the long-term stability issues of metal-halide perovskite solar cells? Who are the top three research groups currently leading in PCE (Power Conversion Efficiency) breakthroughs?"*

*Can you help?*

### [PHASE 1: QUERY ANALYSIS]

## Research Plan

**Query type:** mixed (breadth-dominant for stability consensus + relation-dominant for identifying top research groups)

**Complexity:** moderate

**Question interpreted as:** Two linked sub-questions: (1) What is the current scientific consensus on strategies for overcoming long-term stability challenges in metal-halide perovskite solar cells? (2) Which three research groups are currently leading in power conversion efficiency (PCE) breakthroughs?

### **Knowledge types needed:**

- Peer-reviewed research: 3 — essential for both stability strategies and PCE records
- Preprints/working papers: 2 — fast-moving field, recent breakthroughs may not yet be in journals
- Trade/professional press: 1 — useful for tracking recent PCE record announcements
- News/journalism: 1 — PCE records often get press coverage
- Gray literature: 0 — not relevant
- Government/official: 0 — not relevant

### **Search strategy:**

1. OpenAlex semantic: "current strategies for improving long-term stability of metal-halide perovskite solar cells" — 10 results
2. OpenAlex keyword: "perovskite solar cell stability degradation" — 10 results (recent, highly cited)
3. Academic search keyword: "perovskite solar cell power conversion efficiency record" —

10 results (sorted by recency)

4. Web search for latest certified PCE records and leading groups — to identify current record-holders
5. Author/institution lookups for top PCE groups — to confirm affiliations and recent output

**Estimated scope:** 15–25 sources

**Output format:** Markdown (narrative synthesis with key references, not a full bibliography — appropriate for a patron reference answer)

**Quality signals to prioritize:**

1. **Recency** — PCE records and stability approaches evolve rapidly
2. **Citation count** — for identifying consensus review articles
3. **Author expertise** — essential for identifying leading groups

Does this plan look right? Any aspects you'd like me to weight more heavily — for instance, should I focus more on the stability question, the PCE leaders, or give them equal treatment?

*I think that looks good--give them equal treatment, I think*

Let me start the searches.

I'll begin with the stability consensus literature and PCE breakthroughs in parallel across different tools.

Let me fix the parameter issue and re-run the searches.

Good, the semantic search worked well. Let me continue with the remaining searches.

Let me get more detail on the top groups and recent stability review articles.

**[PHASE 2–3: DISCOVERY & TRIAGE — Results]**

I've completed the searches and have a solid picture. Here's what I found:

---

## **Part 1: Current Consensus on Overcoming Long-Term Stability**

The stability challenge for metal-halide perovskite solar cells stems from their sensitivity to moisture, oxygen, heat, light, and mechanical stress. The current consensus, drawn from multiple high-impact reviews and recent research, centers on several converging strategies:

**Transition to inverted (p-i-n) architecture.** The field has largely shifted from the conventional

n-i-p structure to inverted p-i-n devices. This architecture is more compatible with tandem configurations and shows inherently better operational stability, particularly under reverse-bias conditions. A 2025 review in *Nature Reviews Clean Technology* identified this as a defining trend of the current era.

**Self-assembled monolayers (SAMs) as hole-transport layers.** SAMs — particularly those with carbazole units and phosphonate or methoxysilane anchoring groups — have replaced conventional organic hole-transport materials like spiro-OMeTAD. They improve interface quality, reduce defect-mediated recombination, and contribute to devices that retain over 96% of initial efficiency after 2,000 hours of damp-heat testing (85°C / 85% RH). This is a major milestone toward meeting IEC 61215 certification requirements.

**2D/3D perovskite heterojunctions.** Incorporating low-dimensional (2D) perovskite layers at surfaces and grain boundaries has become a leading passivation strategy. Azmi et al. (2022, *Science*) demonstrated damp-heat-stable devices using tailored-dimensionality 2D/3D heterojunctions — a paper that has accumulated over 760 citations and is widely regarded as a landmark in the stability literature. [Check for LibKey Access](#)

**Compositional engineering and defect suppression.** Strategies like suppressing atomic vacancies through isovalent small-ion incorporation (Saidaminov et al., 2018), initializing film homogeneity to prevent phase segregation (Bai et al., 2022, *Science*), and stabilizing the alpha-phase of FAPbI<sub>3</sub> have become consensus approaches. [Check for LibKey Access](#)

**Interface and barrier engineering.** Controlling degradation at the metal contact interface (Boyd et al., 2018) and developing all-inorganic interface-stabilized cells with accelerated aging validation (Zhao et al., 2022, *Science*) are recognized as essential for long-term thermal stability. [Check for LibKey Access](#)

**Encapsulation.** While the intrinsic stability strategies above have advanced dramatically, robust encapsulation remains necessary for commercialization. The combination of intrinsic stabilization + encapsulation is the current consensus path.

For a comprehensive review of degradation mechanisms, Boyd et al. (2018) in *Chemical Reviews* (1,664 citations) remains the foundational reference. [Check for LibKey Access](#)

---

## Part 2: Top Three Research Groups Leading in PCE Breakthroughs

Identifying the "top three" depends somewhat on the cell category (single-junction, tandem,

all-perovskite), but the groups most consistently pushing certified PCE records are:

### **1. Tan Hairen's Group — Nanjing University (China)**

Prof. Tan Hairen's lab is arguably the most prolific record-setter across multiple perovskite categories. His group broke the 30% efficiency barrier for all-perovskite tandem cells (published in *Nature*, October 2025), previously set the world record for large-area all-perovskite tandems at 24.5% (published in *Science*, February 2024), and demonstrated 28.2% for 1.05 cm<sup>2</sup> all-perovskite tandems. He also founded Renshine Solar, whose rigid cell efficiency reached 31.27% in 2025. This group is a dominant force in the all-perovskite tandem space.

### **2. Peng Jun & Zhang Xiaohong's Group — Soochow University (China), in collaboration with UNSW (Australia)**

This team holds the current world record for single-junction perovskite cells: 27.3% certified efficiency (0.1 cm<sup>2</sup>) and 26.9% (1 cm<sup>2</sup>), both confirmed on the NREL Best Research-Cell Efficiency Chart. Their work with UNSW (where Prof. Anita Ho-Baillie has been a key collaborator) also extends to triple-junction perovskite cells, where they achieved 27.06% for a 1 cm<sup>2</sup> device with IEC thermal cycling certification.

### **3. LONGi Green Energy Technology (China)**

LONGi's R&D team holds the world record for perovskite-silicon tandem cells at 34.85% (NREL-certified, April 2025), building on a trajectory from 33.9% (2023) → 34.6% (2024) → 34.85% (2025). While LONGi is an industrial lab rather than a university group, their contributions represent the leading edge of the tandem pathway that many consider the most commercially viable route for perovskites. Their work has involved collaborations with Soochow University, Huaneng Clean Energy Research Institute, and Hong Kong Polytechnic University.

**Honorable mentions:** KAUST (Saudi Arabia) for Randi Azmi and colleagues' 2D/3D stability work; Oxford PV (UK) for commercial tandem module deployment; and EPFL (Switzerland) for foundational contributions to perovskite photovoltaics.

---

Would you like me to compile this into a formatted document for the patron, or export any of the key references to Zotero? I can also search the Chester Fritz catalog for any of these review articles if the patron needs access.Sources:

- [LONGi 34.85% Record Announcement](#)
- [China team breaks 30% barrier — CGTN](#)
- [Soochow/UNSW 27% Record — ACAP](#)

- [Key advances in perovskite solar cells in 2025 — Nature Reviews Clean Technology](#)
- [Nanjing University 24.5% large-area tandem — PVTIME](#)
- [University of Sydney triple-junction record](#)

## Homebrew + Complex query:

*I have a patron who has a reference question regarding deep-sea mining:*

*"What is the current scientific consensus on the ecological impact of polymetallic nodule mining in the Clarion-Clipperton Zone? Combine this with recent reports from the International Seabed Authority (ISA) and industry statements from companies like The Metals Company."*

*Can you help?*

### [PHASE 1: QUERY ANALYSIS]

## Research Plan

**Query type:** mixed (breadth across ecological impact literature + relational traversal to ISA reports and specific company statements)

**Complexity:** complex — spans peer-reviewed science, intergovernmental body reports, and industry sources

**Question interpreted as:** What does the scientific literature say about ecological impacts of polymetallic nodule mining in the Clarion-Clipperton Zone (CCZ), and how do ISA regulatory/scientific reports and industry positions (especially The Metals Company) align with or diverge from that consensus?

### Knowledge types needed:

- Peer-reviewed research: 3 — essential for establishing scientific consensus on ecological impacts
- Gray literature: 3 — ISA technical reports, environmental impact assessments, NGO analyses
- Government/official: 2 — ISA regulatory documents, Mining Code status
- Trade/professional press: 2 — industry statements, mining sector coverage
- Preprints/working papers: 1 — fast-moving field, some relevant preprints likely
- News/journalism: 1 — useful for recent ISA meeting outcomes and Metals Company public positions
- Books/monographs: 0 — too slow-moving for this topic

### Search strategy:

1. OpenAlex semantic: "ecological impact of polymetallic nodule mining"

- Clarion-Clipperton Zone" — 10 results
2. OpenAlex keyword: "Clarion-Clipperton" + "biodiversity" or "benthic" — 10 results (catch different terminology)
  3. Academic search for ISA-affiliated scientific publications — 10 results
  4. Web search for ISA technical studies and Mining Code updates — 5 results
  5. Web search for The Metals Company environmental claims and NORI-D project — 5 results
  6. Web search for recent NGO or independent scientific assessments — 5 results
  7. CFL check for key items if physical access matters

**Estimated scope:** 25–35 sources across three categories (scientific literature, ISA/regulatory, industry)

**Output format:** Markdown annotated bibliography grouped by source type, with synthesis notes on where consensus, uncertainty, and disagreement lie. Will offer .docx conversion after review.

**Quality signals to prioritize:**

1. **Recency** — regulatory landscape shifting rapidly (ISA Mining Code negotiations)
2. **Source authority** — high-impact marine science journals, ISA official documents
3. **Methodological rigor** — systematic reviews, large-scale field studies (e.g., DISCOL, MIDAS, MiningImpact projects)

Does this approach look right? A few questions before I start searching:

- **Depth vs. breadth:** Should I aim for a comprehensive bibliography (30+ sources), or a more curated set of ~15–20 key items with stronger annotations?
- **Framing:** Should the final product explicitly compare the three perspectives (science, ISA, industry), or just present sources and let the patron draw conclusions?
- **Zotero:** Would you like me to export the final list to your Zotero library as well?

*Let's try for depth if we can. Feel free to synthesize and weigh the evidence you find; we'll think about Zotero at the end*

Great — depth with synthesis it is. Let me start searching. I'll work through the sources sequentially and report back with what I find.

Good first pass — strong foundational literature. Let me now search with different keywords to catch biodiversity and recovery-focused studies, and simultaneously search for more recent work.

Good scholarly haul. Now let me search for ISA documents and regulatory material, plus The Metals Company.

Excellent. Let me now get the specific recent study from Nature Ecology & Evolution and search

for more ISA scientific/technical documents and NGO assessments.

Let me get the specific Nature Ecology & Evolution paper and check CFL, then search for the key Frontiers review paper on EIA frameworks.

Now let me get the Nature paper properly, plus the companion Nature paper on long-term recovery.

## [PHASE 2 & 3: DISCOVERY & TRIAGE RESULTS]

I've completed searching across scholarly databases (OpenAlex, Semantic Scholar), web sources (ISA, news, NGOs), and the Chester Fritz catalog. Here's what I've found, organized by tier:

### Essential Sources (16 items)

#### Peer-reviewed — ecological impacts & biodiversity:

#	Citation	Year	Why Essential
1	Jones et al., "Long-term impact and biological recovery in a deep-sea mining track," <i>Nature</i>	2025	<b>Landmark study:</b> 40-year follow-up showing persistent impacts, limited recovery — strongest direct evidence on recovery timescales
2	Stewart et al., "Impacts of an industrial deep-sea mining trial on macrofaunal biodiversity," <i>Nature Ecology &amp; Evolution</i>	2025	First quantitative species-level dataset from a commercial-scale mining test (TMC's 2022 NORI-D trial): 37% density decrease, 32% species richness decline
3	Simon-Lledó et al., "Biological effects 26 years after simulated deep-sea mining," <i>Scientific Reports</i>	2019	Key DISCOL follow-up: showed nodule fauna had not recovered after 26 years
4	Vanreusel et al., "Threatened by mining, polymetallic nodules are required to preserve abyssal epifauna," <i>Scientific Reports</i>	2016	Demonstrated nodules themselves are essential habitat, not just mineral deposits
5	Jones et al., "Biological responses to disturbance from simulated deep-sea polymetallic nodule mining," <i>PLoS ONE</i>	2017	Major review synthesizing disturbance experiment results

6	Washburn et al., "Patterns of macrofaunal biodiversity across the CCZ," <i>Frontiers in Marine Science</i>	2021	CCZ-wide biodiversity baseline — critical for understanding what's at risk
7	Drazen et al., "Midwater ecosystems must be considered when evaluating environmental risks," <i>PNAS</i>	2020	Expanded impact framework beyond benthos to include water-column effects

**Peer-reviewed — sediment plume dynamics:**

#	Citation	Year	Why Essential
8	Munoz Royo et al., "Extent of impact of deep-sea nodule mining midwater plumes," <i>Communications Earth &amp; Environment</i>	2021	Field data on plume extent and thresholds
9	Munoz Royo et al., "An in situ study of abyssal turbidity-current sediment plumes," <i>Science Advances</i>	2022	First in situ plume measurements from a preprototype collector
10	Gillard et al., "Physical and hydrodynamic properties of mining-generated sediment plumes," <i>Elementa</i>	2019	Plume modeling in the CCZ

**Peer-reviewed — protected areas & conservation planning:**

#	Citation	Year	Why Essential
11	Jones et al., "Environment, ecology, and potential effectiveness of an area protected from deep-sea mining," <i>Progress in Oceanography</i>	2021	Assessed ISA's APEI-6 — found it only partially representative of nearby contract areas

**Overviews & gray literature:**

#	Citation	Year	Why Essential
12	Miller et al., "An overview of seabed mining including environmental impacts and knowledge gaps," <i>Frontiers in</i>	2018	Highest-cited overview (551 citations), foundational reference

### *Marine Science*

- |    |   |      |  |
|----|---|------|--|
| 13 | Cuyvers et al., "Deep seabed mining: a rising environmental challenge," IUCN                                    | 2018 | Authoritative NGO/intergovernmental assessment   |
| 14 | Ning, "Advancing EIA framework for deep-sea mining: critical review," <i>Frontiers in Marine Science</i>        | 2025 | Most current analysis of ISA regulatory gaps   |
| 15 | Gollner et al., "Deep-seabed mining: environmental knowledge and implications," Brill                           | 2025 | Current chapter-length synthesis on environmental knowledge  |
| 16 | Katona et al., "Ethical opportunities in deep-sea collection of polymetallic nodules from the CCZ," <i>IEAM</i> | 2021 | <b>Industry-adjacent perspective</b> — authors affiliated with The Metals Company; argues for ethical framing of nodule collection |

### **Useful Sources (5 items)**

- | #  | Citation   | Year | Contribution  |
|----|--|------|---|
| 17 | Bonifácio et al., "Alpha and beta diversity of polychaete assemblages across the CCZ," <i>Biogeosciences</i>                     | 2020 | Detailed taxonomic baseline for a key indicator group                                 |
| 18 | Miljutin et al., "Deep-sea nematode assemblage has not recovered 26 years after experimental mining," <i>Deep-Sea Research I</i> | 2011 | Meiofaunal non-recovery evidence (complements Simon-Lledó's macro/megafauna findings) |
| 19 | Uhlenkott et al., "Megafauna diversity and abundance in a CCZ exploration area," <i>Marine Biodiversity</i>                      | 2023 | Detailed megafauna baseline for German contract area                                  |
| 20 | Spearman et al., "Measurement and modelling of deep sea sediment plumes," <i>Scientific Reports</i>                              | 2020 | Plume modeling with practical implications  |

21 Simon-Lledó et al., "Ecology of a polymetallic nodule occurrence gradient," *Limnology and Oceanography* 2019 Shows how nodule density structures community composition

## Key Non-Scholarly Sources (regulatory & industry)

Source	Type	Summary
ISA EIA Framework page	Regulatory	6 contractors had completed EIAs as of Feb 2025; Mining Code still incomplete
ISA Council 30th session (July 2025)	Regulatory	Failed to reach consensus; no exploitation contracts issued
ISA Scientific Advisory Board Brief (Oct 2025)	Regulatory	SAB summary on deep-sea mining science
Pew Charitable Trusts moratorium fact sheet (2025)	Advocacy/policy	40 countries now support moratorium or pause
Deep Sea Conservation Coalition moratorium tracker	Advocacy/policy	Running tally of state positions
The Metals Company NOAA application (April 2025)	Industry	Filed application for US permit following Trump executive order

## Quality Flags

- **Katona et al. (2021)**: Co-authors include Metals Company affiliates — relevant for the patron's question but should be read as industry-adjacent, not independent science.
- Some older items (Thiel 2001, Rolinski 2001) are historically important but superseded by recent field data.

---

The evidence is strong enough to synthesize now. Shall I go ahead and compile the full annotated bibliography with a synthesis section weighing the three perspectives (scientific consensus, ISA/regulatory status, and industry position)? I'll deliver it as markdown, and we can discuss Zotero export or .docx conversion after you've reviewed it.

*Yes please!*

Here's the completed bibliography:

[https://docs.google.com/document/d/1fFrY7dFeZA9\\_IS1RNo-EpiOp0KIJtt9Uorwua88IP4Y/edit?usp=sharing](https://docs.google.com/document/d/1fFrY7dFeZA9_IS1RNo-EpiOp0KIJtt9Uorwua88IP4Y/edit?usp=sharing)

It covers 28 sources organized into seven sections: core ecological impact studies, sediment plume research, conservation planning, reviews and regulatory analysis, industry-affiliated perspectives, taxonomic baselines, and key gray literature. The opening synthesis weighs the three perspectives your patron asked about — scientific consensus, ISA regulatory status, and industry positions — and an appendix offers guidance on reading for positionality.

The two biggest items for your patron to know about are probably the 2025 *Nature* paper (Jones et al.) showing persistent impacts 40 years after a mining test, and the 2025 *Nature Ecology & Evolution* paper (Stewart et al.) documenting a 37% density decrease from The Metals Company's own commercial-scale trial. Those two papers substantially changed the evidentiary landscape.

Would you like me to export any or all of these to your Zotero library, or convert the document to .docx?

---

*Note: If you don't read the bibliography, I do want to pull out this appendix it created:*

## Appendix: How to Read This Literature — A Note on Positionality

**Independent marine scientists** (e.g., Jones, Simon-Lledó, Drazen, Vanreusel) have produced the bulk of the empirical evidence. Their work consistently documents significant ecological harm and long recovery times. Several have signed public statements calling for a moratorium, but their published findings predate and form the basis for those positions rather than following from them.

**The ISA** occupies a conflicted institutional position as both regulator and promoter of deep-sea mining under UNCLOS. Its scientific publications and advisory board outputs tend to be more cautious in their conclusions than independent research. The ISA's Legal and Technical Commission reviews contractor EIAs but does not publish its assessments publicly, limiting external scrutiny.

**The Metals Company** has funded or facilitated some research (including providing access for the Stewart et al. 2025 study) while also publishing its own comparative life-cycle analyses. Their public statements emphasize the relative environmental

advantages of nodule collection over terrestrial mining — a framing that independent scientists have challenged as incomplete.

**Environmental NGOs** (Pew, DSCC, Greenpeace, IUCN) have been significant funders of independent research and policy analysis. Their advocacy positions generally align with the scientific consensus but should be distinguished from the primary research itself.