



Roles/responsibilities of researchers

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Who is a Researcher?

Defining the Role Beyond the Bench/Desk

- Beyond experiments/analysis: A **creator, discoverer, communicator, mentor, manager**, and **steward**.
- Role varies by stage and setting:
 - PhD Student, Postdoc, Research Staff
 - Faculty Member (Assistant/Associate/Full Professor)
 - Scientist in Industry / Government Labs / NGOs
- Common thread: Pursuit of new knowledge and understanding.
- Critical importance of understanding *ethical* and *professional* obligations inherent in this role.



Why Focus on Roles and Responsibilities?

The Pillars of Trustworthy and Impactful Research

- **Trust:** Maintaining public, peer, and funder trust in science and its practitioners. (*Essential for societal support*)
- **Reliability:** Ensuring the validity and reproducibility of research findings. (*Foundation of scientific progress*)
- **Funding & Resources:** Ethical conduct is often a prerequisite for grants and institutional support.
- **Environment:** Fostering a positive, productive, safe, and inclusive research environment.
- **Integrity:** Avoiding research misconduct (FFP) and questionable research practices (QRPs) and their severe consequences.
- **Development:** Crucial for personal and professional growth, career progression, and reputation.



Why Focus on Roles and Responsibilities?

The Pillars of Trustworthy and Impactful Research

Think: What happens when these pillars weaken? (Examples: High-profile retractions, funding freezes, loss of public confidence)



Research Integrity and Ethics

The Bedrock: Honesty, Objectivity, Transparency, Accuracy

Core principles:

- **Honesty:** In proposing, performing, reporting data, and representing findings. No cheating.
- **Objectivity:** Minimizing bias in design, analysis, interpretation, peer review, personnel decisions. Acknowledging conflicts of interest.
- **Transparency:** Openness about methods, data (where possible), limitations, and funding sources. Enabling scrutiny.
- **Accuracy:** Diligence in data collection, calculations, and reporting. Correcting errors promptly and openly.



Research Integrity and Ethics

The Bedrock: Honesty, Objectivity, Transparency, Accuracy

Research Misconduct: The Cardinal Sins

- **Fabrication:** Making up data or results.
- **Falsification:** Manipulating research materials, equipment, processes, or changing/omitting data such that the research is not accurately represented.
- **Plagiarism:** Appropriating another person's ideas, processes, results, or words without giving appropriate credit. (Includes self-plagiarism in some contexts!)

Note: Questionable Research Practices (QRPs) also erode trust



Rigor and Reproducibility

Ensuring Quality, Reliability, and Verifiability

- **Robust Design:** Careful planning BEFORE starting.
 - Clear research question/hypothesis.
 - Appropriate controls (positive, negative).
 - Adequate statistical power and sample size determination.
 - Randomization and blinding where applicable.
- **Meticulous Execution:** Following protocols carefully, documenting *everything*, including deviations.
- **Detailed Record-Keeping:** Lab notebooks (physical/ELN), code repositories, data dictionaries. Must be understandable by others (and your future self!). *Assume someone needs to reproduce your work from your notes alone.*
- **Valid Analysis:** Using appropriate statistical methods, understanding assumptions, reporting limitations. Avoiding data dredging/p-hacking.



Rigor and Reproducibility

Ensuring Quality, Reliability, and Verifiability

Reproducibility vs. Replicability

- **Reproducibility (Computational):** Can others obtain the same results using the original author's data and code? (Focus on methods transparency)
- **Replicability (Inferential):** Can others obtain consistent results by conducting a new study with similar methods but new data? (Focus on robustness of findings)



Data Management: Lifecycle Responsibility

Handling the Foundation: From Creation to Preservation

Key aspects:

- **Acquisition & Documentation:** Accuracy, metadata (context!), instrument calibration logs, standardized formats.
- **Storage & Security:** Robust backups (3-2-1 rule?), access controls, physical security, institutional repositories/servers.
- **Ownership & Compliance:** Understand institutional policies, funder mandates (e.g., NIH, NSF data sharing policies), ethical/privacy constraints (e.g., human subjects data).
- **Sharing & Access:** Benefits (verification, reuse, collaboration) vs. Challenges (IP, privacy, effort). Use of data repositories (e.g., Zenodo, Dryad, Figshare, discipline-specific ones).



Data Management: Lifecycle Responsibility

Handling the Foundation: From Creation to Preservation

FAIR Principles: Guiding Data Stewardship

Data should be:

- **F**indable: Assign persistent identifiers (DOIs), rich metadata.
- **A**ccessible: Retrievable by standard protocols (openly, if possible).
- **I**nteroperable: Use standard formats, vocabularies, ontologies.
- **R**eusable: Sufficient metadata, clear usage license, provenance.

Data Management Plan (DMP): Often required for grants. Outlines data types, standards, storage, sharing, preservation plans.



Publication and Authorship Ethics

Communicating Research Accurately and Fairly

Responsibilities in Publishing:

- Report findings **accurately, completely, and clearly**. Include limitations. (Avoid selective reporting).
- Avoid redundant/duplicate publication ('salami slicing'). Justify multiple publications from the same dataset.
- Ensure proper **authorship attribution**. Discuss early and often!
- Follow established guidelines (e.g., ICMJE - International Committee of Medical Journal Editors):
 - Substantial contributions to: conception/design OR acquisition OR analysis/interpretation of data; AND
 - Drafting the work or revising it critically for important intellectual content; AND
 - Final approval of the version to be published; AND
 - Agreement to be accountable for all aspects of the work.
- **Acknowledgements:** Recognize contributions not meeting authorship criteria (technical help, funding, reagents).



Publication and Authorship Ethics

Communicating Research Accurately and Fairly

Responsibilities as a Peer Reviewer

- Provide timely, constructive, and objective feedback.
- Maintain confidentiality of manuscript.
- Declare conflicts of interest.
- Do not misappropriate ideas or data.



Intellectual Property (IP) Awareness

Understanding Ownership, Rights, and Commercialization

- **What is IP in research?** Inventions (patentable), software (copyright/patent), data (database rights/copyright), creative works (copyright), know-how/trade secrets.
- **Ownership:** Typically, IP generated using institutional resources belongs to the *institution*, not the individual researcher (check your institute's policy!). Governed by employment agreements and funding terms.
- **Disclosure:** Obligation to promptly disclose potentially patentable inventions to the institute's Technology Transfer Office (TTO) or equivalent *before* public disclosure (publication, presentation).



Intellectual Property (IP) Awareness

Understanding Ownership, Rights, and Commercialization

- **Key IP Types:**

- Patents: Protect inventions (novel, useful, non-obvious). Grants exclusive rights for 20 years.
- Copyright: Protects original works of authorship (papers, software code, books). Automatic.

- **Balancing Act:** Publication (dissemination) vs. Patenting (protection for commercialization). TTO helps navigate this.

- **Benefit Sharing:** If IP is licensed/commercialized, inventors often share in the revenue (as per institutional policy).

Key takeaway: Know your institutional IP policy and engage with the TTO early!



Towards Laboratories and Shared Resources

Safety, Efficiency, and Stewardship in Shared Spaces

Safety First: Non-Negotiable

- Know & follow protocols (Chemical, Biological - BSL levels, Radiation, Physical hazards).
- Use PPE correctly (lab coats, gloves, eye protection). When and what?
- Proper waste segregation & disposal.
- Emergency preparedness: Know locations of safety equipment (showers, extinguishers, spill kits) and procedures.
- Report ALL accidents, near misses, hazards promptly. Foster a 'safety culture'.

Resource Management & Stewardship

- Efficient use of consumables (avoid waste). Order responsibly.
- Care for shared equipment: Proper use, cleaning, logbooks, reporting issues immediately.
- Respect booking systems & schedules.
- Data/sample storage: Label clearly, maintain inventory, respect shared freezer/storage space.
- Contribute to general lab cleanliness and organization.



Towards the Institute: Institutional Citizenship

Adherence, Representation, and Contribution

Being a responsible member of the institutional community:

- **Compliance:** Adhere to all relevant institutional policies:
 - HR (leave, conduct), Finance (purchasing, travel).
 - Research Ethics Committees (IRB/IEC for humans, IAEC/IACUC for animals)
 - GET approvals BEFORE starting.
 - Biosafety (IBC), Radiation Safety, Chemical Safety committees.
 - Data security and IT usage policies.
- **Funder Requirements:** Comply with grant terms and conditions (reporting, budgeting, data sharing, effort reporting). Acknowledge funding sources correctly.
- **Representation:** Act professionally when representing the institute (conferences, collaborations, outreach). Uphold its reputation.



Towards the Institute: Institutional Citizenship

Adherence, Representation, and Contribution

Being a responsible member of the institutional community:

- **Contribution (where applicable):** Engage in teaching, mentoring students, committee service, peer review, outreach activities. Contribute to a vibrant academic environment.
- **Navigate Bureaucracy:** Understand processes for approvals, grants management, etc. Seek help from administrative staff respectfully.



Towards Co-workers: Collaboration and Mentorship

Building a Supportive, Productive, and Synergistic Team

Effective Collaboration

- Open, honest, timely communication.
- Clearly define roles, responsibilities, expectations, and authorship upfront.
- Share expertise, resources, and credit fairly. Acknowledge contributions.
- Respect diverse perspectives and methods.
- Manage competition constructively and ethically.
- Address issues proactively.



Towards Co-workers: Collaboration and Mentorship

Building a Supportive, Productive, and Synergistic Team

Mentorship: Giving and Receiving

- **As Mentor:** Provide guidance, constructive feedback, support, advocacy, networking opportunities. Set clear expectations. Be accessible. Foster independence.
- **As Mentee:** Be proactive, prepared for meetings, respectful of mentor's time, open to feedback, take initiative. Drive the relationship.
- Mentorship is crucial at ALL stages. Seek multiple mentors for different needs.
- Ethical mentoring: Avoid exploitation, maintain confidentiality, manage conflicts of interest.



Towards Co-workers: Respect, Inclusivity, and Conflict

Fostering a Healthy and Professional Environment

- **Respect:** Treat all colleagues (peers, seniors, juniors, staff) with courtesy and professionalism, regardless of status, background, discipline, or identity.
- **Inclusivity & Equity:** Actively foster an environment where everyone feels welcome, valued, and has equal opportunity to succeed. Be aware of unconscious bias. Challenge discrimination and prejudice.
- **Unacceptable Behaviour:** Zero tolerance for bullying, harassment (sexual or otherwise), intimidation, microaggressions, or discrimination. Know your institute's policies and reporting channels (HR, Ombudsperson, specific committees). Support those affected.



Towards Co-workers: Respect, Inclusivity, and Conflict

Fostering a Healthy and Professional Environment

Constructive Conflict Resolution

Disagreements are normal; destructive conflict is not.

- Address issues early, directly, and privately (if appropriate and safe).
- Focus on the *issue*, not the *person*. Use "I" statements. Listen actively.
- Seek common ground and solutions. Be willing to compromise.
- Escalate if needed: Seek mediation from PI/supervisor, Head of Department, Ombudsperson, or HR. Document interactions if conflict persists.



Role of Legacy in Research

Building Upon, Acknowledging, and Contributing To Knowledge

Research is a cumulative enterprise:

- **Understand Context:** Know the history of your field – key discoveries, theories, debates, and dead ends. Read foundational papers.
- **Acknowledge Predecessors:** Cite relevant prior work accurately and thoroughly. Avoid "citation plagiarism" or selectively citing only supportive work. Give credit where it's due.
- **Build Upon, Don't Just Repeat:** Clearly articulate how your work extends, challenges, or clarifies existing knowledge. Avoid unnecessary duplication ("reinventing the wheel").
- **Learn from the Past:** Analyze successes and failures reported in the literature (including your own group's).



Role of Legacy in Research

Building Upon, Acknowledging, and Contributing To Knowledge

- **Contribute Durably:** Aim for findings that are robust and reliable, forming a solid block for future research. This includes sharing data/methods (see Reproducibility).
- **Preservation:** Ensure your data, materials (e.g., cell lines, plasmids, code), and records are preserved and accessible for future verification or use (linking back to Data Management).



Continuation of Research Activities

Ensuring Sustainability, Knowledge Transfer, and Long-Term Vision

Research extends beyond individual projects or personnel:

- **Long-Term Vision:** Think about the larger goals of the research program, not just the next paper. How do projects connect?
- **Documentation for Continuity:** CRITICAL. Detailed protocols (SOPs), well-commented code, organized data with metadata, comprehensive lab notebooks. Essential for handovers.
- **Knowledge Transfer:** When transitioning (graduating, changing jobs), ensure a smooth handover. Train successors, provide comprehensive notes, ensure data/materials are accessible.
- **Succession Planning (PIs/Leaders):** Developing junior researchers to eventually take over projects or leadership roles. Building capacity.



Continuation of Research Activities

Ensuring Sustainability, Knowledge Transfer, and Long-Term Vision

Research extends beyond individual projects or personnel:

- **Sustainable Funding:** Planning for future grant applications, diversifying funding sources where possible.
- **Archiving & Institutional Memory:** Ensuring key findings, data, and materials are properly archived within the lab/institution.



Adaptation with Current Trends

Staying Relevant, Innovative, and Effective in a Dynamic World

Science evolves rapidly; researchers must adapt:

- **Stay Informed:** Continuously monitor literature (journals, preprints), attend conferences/seminars, follow key labs/researchers online (responsibly!).
- **Identify Emerging Areas:** Recognize new techniques (e.g., CRISPR, AI/ML, single-cell seq), technologies, theoretical shifts, funding priorities.
- **Lifelong Learning Mindset:** Be willing to acquire new skills – technical, computational, statistical, analytical, communication. Seek training opportunities.
- **Embrace Interdisciplinarity:** Look for connections and collaborations outside your core field. Many breakthroughs happen at interfaces.



Adaptation with Current Trends

Staying Relevant, Innovative, and Effective in a Dynamic World

Science evolves rapidly; researchers must adapt:

- **Critical Evaluation:** Assess new trends objectively – distinguish hype from genuine advancement. Does a new technique actually help answer *your* research question better?
- **Adapt Research Questions:** Refine or redirect research focus based on new knowledge or changing context to maintain relevance and impact.



Engaging with the State-of-the-Art

Operating at and Pushing the Frontiers Responsibly

Contributing to the cutting edge:

- **Deep Understanding:** Know the current limits of knowledge and technology in your specific niche. What are the key unsolved problems?
- **Innovation & Novelty:** Aim to contribute original findings, methods, or insights that genuinely advance the field.
- **Mastery of Advanced Techniques:** Utilize state-of-the-art tools and methods effectively, understanding their capabilities and limitations.
- **Ethical Foresight:** Critically consider the potential societal and ethical implications of cutting-edge research (e.g., AI bias, gene drive consequences, dual-use research). Engage in responsible innovation discussions.



Engaging with the State-of-the-Art

Operating at and Pushing the Frontiers Responsibly

Contributing to the cutting edge:

- **Collaboration at the Frontier:** Partner with other leading experts to tackle complex, state-of-the-art challenges.
- **Peer Review at the Edge:** Fairly but critically evaluate novel, potentially paradigm-shifting work submitted for publication or funding.



Bringing It All Together: Interconnected Responsibilities

A Web of Professional Obligations

These roles are not separate silos; they are deeply interconnected:

- Poor **Data Management** (Work) Impacts **Collaboration** (Co-workers) & **Reproducibility** (Legacy)
- Ignoring **Safety Protocols** (Lab) Risks **Co-worker** safety & damages **Institute** reputation
- Lack of **Adaptation** (Trends) Hinders contribution to **State-of-the-Art** & reduces impact (**Legacy**)
- Unethical **Authorship** Practices (Work) Damages **Collaboration** & **Mentorship** relationships
- Failure in **Knowledge Transfer** (Continuity) Wastes **Resources** & hinders future **Legacy** building



Final Thoughts: Upholding the Values of Research

Your Role in the Scientific Enterprise

- Your actions, big and small, define your professional **reputation** and contribute to the collective reputation of science.
- Responsible conduct is more than avoiding misconduct; it's about actively promoting **integrity, rigor, fairness, and respect** in all professional activities.
- **Don't guess when unsure!** Seek guidance from mentors, PIs, colleagues, institutional ethics/compliance offices, or official guidelines. It's a sign of strength, not weakness.
- Embrace these multifaceted responsibilities as integral to a **successful, ethical, and fulfilling research career**.
- Your contributions, conducted responsibly, help build a better future through reliable knowledge.



Roles/responsibilities of researchers

Thank You for Listening!