

Nano and Quantum Technologies Laboratory

A guide to ethical behavior in N/QTL research groups

Introduction to N/QTL

N/QTL (known as NanoteQ locally) is a research center of Wake Forest University. The main facility at 95 W 32nd Street has a wide variety of microscopy, materials synthesis, characterization, and cleanroom fabrication tools. This is, in general, a regional level facility the equal of those at our local peer institutions such as Vanderbilt, Duke, and Emory. The Lab hosts multiple WFU research groups as *members*, giving them privileged (superuser) access to tools and services. The lab also provides for external and internal non-member users who: pay for hourly use of tools, participate in training workshops or collaborate with members. Students and staff of all hosted groups mingle and share office and lab space, with the aim of generating cross pollination of disciplines.

While all member groups are expected to participate in management of the lab's equipment and preservation of capabilities, the *Carroll Research Group* as founding members, is unique in taking on a heavier share of the responsibility of management and training. This is in keeping with Prof. Carroll's philosophy which emphasizes technical skills combined with heuristic models.

The emphasis areas of N/QTL research are:

- I. **Green Worlds Tech:** photovoltaics, thermoelectrics, high efficiency lighting, active coloration and signature modification.
- II. **Human-Technology Interfaces:** strain, pressure and gas sensing, analyte recognition enhancement based on self-gain sensing platforms, cyborgnetics.
- III. **Quantum Information Processing:** metamaterial structures and new nanostructures. Materials structures for quantum information processing. Qubits, quantum computing architectures, quantum sensors.
- IV. **Synthetic Intelligence:** Machine learning and artificial intelligence. ML and AI used in QIS to perform error suppression.

The tools we manage:

- I. **Microscopy:** TEM, HRTEM, XPS, SEM, AFM, STM, optical microscopes, Raman Lab
- II. **Cleanroom:** PECVD, RIE, optical i-line Lith, Sputter, ebeam, FIB, NPGS, packaging
- III. **Synthesis:** Chem Lab, ovens, flash chromatography, ultracentrifuge, MBE
- IV. **Transport and Optics:** An assortment of transport and optics capabilities including 300 mK and high field transport, GHz signal generators and shapers, ps transient absorption, etc.

Scientific Style

N/QTL is dedicated to the highest possible standards in the conduct, presentation, and reporting of research. We engage in the national dialogue pertaining to nano and quantum technologies, strive to be at the forefront of new phenomenology, new vistas and new paradigms, and we embrace emerging directions and the uncharted territory. To do this N/QTL and its colleagues *must* adopt an open and *collaborative posture*.

Ethical Standards

The true *collaboration* requires an adherence to ethical standards and codes of interaction that engender trust among participants and that respects each individual, their right to free and unfettered enquiry and their right to full participation within the collaborative. No written set of rules or regulations can provide this. There is no code that can ensure behaviors which should naturally derive from the personality. Moreover, since we are talking about actions *between* individuals, there is no way to legislate a willingness to understand the vastly different social and moral constructs of the people from around our world.

The only thing possible is to insist that within the working environs of N/QTL it is expected that each researcher interacts with a sense of fairness and respect. It is the responsibility of every researcher to actively build trust and open discourse. In the lab.

Here is presented a set of ***Ethical Guidelines*** which illustrate the principles of the N/QTL community. This “code” is not intended as complete, but is rather illustrative and is designed as a set of exemplar guidelines for students, faculty, collaborators and guests. It also provides several important definitions as well as the university policies relative to some specific behaviors. This document is based upon that of the American Physical Society (US) with modifications for our specific context, and it is applied within the rules and regulations of Wake Forest University. However it is important to note, these guidelines are generally consistent with long-standing traditions within the larger scientific community.

The APS Ethical guidelines adopted by the Board of Directors: Dec. 16, 2024, Effective: Jan. 1, 2025 are shown here in **black**. N/QTL modifications, interpretations and expansions are in **red**.

Introduction and Rationale

It is the mission of [N/QTL] to advance physics by fostering a vibrant, inclusive, and global community dedicated to science and society. These Standards present ethical expectations for all members and colleagues to follow. They fall into three categories: Publication of Scientific Research, Treatment of Colleagues, and Responsibility to the Profession. In each case, the Standards rest on [N/QTL] Core Values, [centering on] Integrity and Respect.

Integrity

Integrity is foundational to science. Simply put, physicists must tell the truth. Data fabrication, falsification, and plagiarism corrupt the progress of science, thereby diminishing its value and damaging public trust. This document contains language from the Committee on Publication Ethics (COPE) to ensure that the [N/QTL] stance aligns with that of the larger scientific community.

Respect

Respect means that physicists must treat others well. Abuse of colleagues, students, or supervisees degrades the conditions for the honest interchange that leads to the best science. [N/QTL further defines respect for another scientist as reciprocation of trust and the establishment of relationships

in which trust is not abused] This document contains standards and explanations to illustrate specific actions that constitute abusive behavior.

Publication of Scientific Research

I. Research Results

Ethics Standard

The publication of research allows for the progress of physics and science in general. It is a societal good that should be done with the aim of maximizing the dissemination of research results.

Researchers should adhere to their governmental and institutional policies on the responsible conduct of research. For U.S. researchers, misconduct is defined by the U.S. Federal Policy on Research

Misconduct to include fabrication, falsification, and plagiarism:

Fabrication is making up data or results and recording or reporting them.

Falsification is manipulating research materials, equipment, or processes or changing or omitting data or results such that the research is not accurately represented in the research record.

Plagiarism is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit. [see plagiarism section below]

[N/QTL notes: Plagiarism as defined here includes the appropriation of another person's "ideas, ..., results, ... words." Ideas and so on, do not necessarily have to be written down, to be widely attributed to some person or group of people. Thus, the presentation and use of such ideas (including conceptual models and basic interpretations of data) as one's own, without proper attribution, is plagiarism. Moreover, *proper attribution* must be agreed upon with the source to which attribution is to be made.]

In general, research misconduct occurs when there is a significant departure from accepted practices of the relevant research community and the misconduct is committed intentionally, knowingly, or recklessly. [N/QTL] members ["members" here is intended in its broadest context to include users, students, postdocs, collaborators, and anyone associated with the use of N/QTL facilities and services] are expected to report research misconduct to the appropriate body (for example, institutions or journals).

[It is the policy of N/QTL to report misconduct to WFU, the journal/s involved, and to all coauthors. Anyone found to be in violation of the standards of research conduct may be removed from N/QTL as a user, collaborator, etc.]

Fabrication and falsification do not include honest errors in scientific practice or differences in opinion about interpretation. On the other hand, covering up or concealing misconduct, retaliation against reporters of misconduct, and malicious allegations of misconduct are all serious ethical violations.

Explanations and Recommendations

Researchers are responsible for properly attributing the work of others and for following all legal mandates that affect publication.

Research data and products (such as protocols, computer code, and study parameters) should be retained **[archived in a publicly addressable format when possible]** for a reasonable period in accordance with journal, funder, and legal mandates.

Research results should be recorded and maintained in a form that allows subsequent use, analysis, review, and reproduction to the maximum extent possible. Exceptions may be appropriate in certain circumstances to preserve privacy, trade secrets, or national security.

Researchers are responsible for raising any questions they may have about the provenance or integrity of data at any stage of the research or publication process according to their institutional policies.

Authors are obliged to provide prompt retractions or corrections of errors in published works. Journals are responsible for correcting errors in published papers or retracting them, as appropriate. Institutions should report concerns about published research to the relevant journal.

Research institutions have authority to establish policies for research misconduct. In the U.S., Federal research misconduct policy provides relevant guidance for purposes of Federal action.

II. Authorship

Ethics Standard

Authorship creates a record of attribution, establishes accountability and responsibility with respect to the work, and is key in establishing careers. **[There are multiple standards for determining authorship including: APS, AIP, ACS, and the ICEMJ criteria. These are used by different fields of science. It must be agreed upon by the researchers which standard shall hold for their work]**

[Typically, N/QTL researchers hold to the standards accepted by APS (as cited here) unless otherwise stated] Authorship should be limited to, and should not exclude, those who have made a significant contribution to the concept, design, execution, interpretation, or writeup of the research study. Authors should be able to identify and attest to their specific contribution to the work. When submitting to a journal, all authors should be aware of and consent to the submission of the work.

Explanations and Recommendations

All authors are accountable for their work and its presentation in a paper. The multidisciplinary nature of research may make this difficult, but early disclosure and discussion of individual contributions can avoid later conflict.

To avoid disputes over attribution of authorship, it may be helpful to decide at the start of writing the paper who will be credited as authors and in what order, who will be acknowledged as contributors, and to validate the decisions with all members of the research team.

All collaborations should establish processes for ensuring the accuracy and validity of reported results.

Corresponding and presenting authors should be sure that all co-authors have approved the content of manuscripts and presentations.

[Most journals and professional societies] recognizes authorship agreements for large collaborations, so long as authorship is determined through a transparent process.

Uncredited (ghost) and undeserved/purchased (guest/gift) authorship is a serious violation of ethical standards.

[Caution: Under any set of standards there are always ways in which authors can be left out. This has more to do with what comes before the paper - whether someone is adequately informed and allowed to participate. No set of standards can dictate with whom you work or make you include those which you wish to exclude. But there are some cases where someone clearly and obviously should have been a part of the team and the team proceeded without their knowledge leaving them out - seemingly on purpose. In larger groups, this is an easy *de facto* way of using someone else's research group as your own. N/QTL deems knowingly participating in such a scenario as unethical but we recognize that there can be a very fine line between the willing misuse of trust and simply extending a courtesy to a postdoc or student.

N/QTL emphasizes shared responsibilities in research relationships. Strong relationships, successful collaborations, and excellent science are all enhanced when we invite qualified, willing, and interested people into our circle as a part of the project. It costs you nothing and may mean a great deal to them. Ensuring that this happens is the ethical responsibility of everyone involved.

EXAMPLE 1: Say a postdoc and a student from another group makes some measurement for the other group and your advisor agrees this is OK. That student and you write a paper with the student's group head as corresponding author. Should the postdoc's advisor also be on this paper? The answer is: of course not, he/she didn't do anything for it except to provide the salary. But let's examine this a little closer. Because of this, the advisor is far less likely to allow such collaborations in the future. He/she feels as if they provided the skilled/trained labor for a project expecting to be allowed to participate and were not so allowed, like a service organization. But the postdoc's advisor is NOT a service organization, they have obligations for the money they used to fund that postdoc. Those obligations invariably involve participating in science and they supported this because of their scientific interest. By excluding him/her from conversations about the data, shared interpretations and participation in authorship you deprived them of the opportunity to add to the science. This feels much more like usury and does not reflect a respectful relationship with the advisor.

It is clear that the advisor should have stated in writing their expectations. But it is equally clear that the postdoc should have extended to the advisor the courtesy of including them *during the science* without such a formal transactional document.

What if the other group's leader didn't want to include the postdoc's advisor? This may raise a red flag or two as to the intentions of the collaboration in general. So, there is an obligation to bring this to the advisor's attention early.

Thus, it is clear that at the point of writing the paper, the Advisor cannot be included. The ethical violation however may have occurred earlier than this and warrants closer scrutiny.

EXAMPLE 2: Consider a student working in the N/QTL microscopy center for a client (user) under contract to create images of some new bacterium. The student interprets the data, writes a report, and the client pays the hourly fees to the center. But the client is so happy with the work, they include the student on their publication of this bacterium. Should the student's research advisor be included on the paper? Here we note that the student could be being paid directly from N/QTL from the client's funds, or from a TA by the student's department, or from an RA with the research advisor (hours are strictly limited in the last two cases). Regardless of the source of funding the answer here is No. Working for a recharge center in this fashion comes with an explicit release that must be approved by both the university and the advisor (this is true in almost all universities and is part of the legal framework for recharge centers generally). It is clear here that the publication is a simple courtesy and not an attempt to suborn the research work of another group. If the client is interested in moving forward with deeper analysis and more extensive work, then the advisor should be consulted.

Within the confines of the fee for services relationship the advisor should not appear on such publications. There is no ethical violation to consider here and the advisor and the University agrees to this by allowing the student's participation in recharge services.]

III. Redundant Publication

Ethics Standard

Redundant publication wastes the time and efforts of editors, referees, and readers. Such publications contain substantially duplicated content, such as wording and figures that are not properly referenced.

Authors should avoid artificially increasing the number of publications by fragmenting the publication of research reports. Special consideration may be given to conference proceedings and presentations that represent preliminary versions of the work.

Explanations and Recommendations

Previous publication of an abstract or abbreviated presentation as part of a meeting does not usually preclude subsequent submission of a longer, more complete version for publication, but full disclosure of the existence of these materials should be included at the time of submission.

If discovered before publication, previous publication is grounds for rejection, and possibly further consequences if it contradicts the journal's policies on disclosing related work.

If discovered after publication, the proper correcting action can range from a corrective note to retraction of the offending article.

Re-publication of a paper in another language is acceptable with the permission of the copyright holder of the original article.

Authors should disclose, at the time of submission, details of related papers, even if in a different language, and similar papers in press.

Simultaneous submissions of the same paper to multiple journals are not allowed.

Preprint servers such as arXiv are a valuable means for sharing new work. Many journals do not consider the submission of a manuscript to a preprint server as redundant publication, but it is the responsibility of the author to follow the relevant journal policies. When the manuscript has been published in a refereed journal, a link to the final document should be added to the preprint.

[Caution: N/QTL recognizes the evolving nature of writing styles and manner of consumption of written materials. Specifically, in many fields of the hard sciences a devolution of written research reports has occur which explicitly reduces the publication template to shorter formats that present only a single finding. This simply recognizes that longer, more complete, multipurposed and archival publications of years past are now less frequently read or cited. Moreover, the shorter, *letter* or *brief* style is now seen in terms of an ongoing conversation within the community – particularly with the development of online journals.

Therefore, the parsing and packaging of research results into smaller, more focused reports is not necessarily an attempt to artificially raise paper numbers, but instead may be an embrace of new writing styles and formats. N/QTL recognizes this as a legitimate approach to publication but encourages authors to act within reason, making sure that each paper is truly stand-alone, complete and of the highest possible standards of scientific reporting. N/QTL further notes that authors should be mindful of all quality factors used in bibliometric evaluation of a research record. This includes numbers, citations, online activities, impact factors, etc.]

IV. Plagiarism

Ethics Standard

Plagiarism is the presentation of others' ideas, data, and writings, including research grant applications and presentation materials, as if they were one's own. It also includes self-plagiarism, unacceptable levels of reuse of one's own work without attribution, even when summarizing past results or background material.

Authors are expected to respect intellectual property and copyright by clearly indicating quotations and the sources of ideas. Publishing or submitting plagiarized material for publication is a serious ethical breach.

[Within a collaboration, this means that an honest, forthright assessment must be made in taking credit, through writing or otherwise, for concepts that were derived from ideas that you may be exposed to in that collaborative environment. (see definitions above) For example, it is unacceptable to use the explanations, data interpretations, and/or models of a research group to write a paper in private for submission to a journal. This is plagiarizing that group's work. The open discussion of such concepts and interpretations in group meeting forums, in hallways, in personal conversations is essential for good science. The appropriation of such information for use in a publication, without prior consent is highly unethical and destroys the team dynamic.

Inviting people to join in after such a publication is started simply forces people to allow such misappropriation and is an equally unethical use of their information.

EXAMPLE 3: A guest collaborator in your lab is introduced to a problem that your team has been working on for several years. He participates in group meetings where he learns about the model that has been developed to explain this problem and he asks specific, detailed questions and shows interest. The team has not yet published their model, but it is clear that they intend to and are working with another theorist to accomplish this. But after a little while you find out that this guest has begun his own study of the problem using a software package that allows him to visualize the model. This work has been kept secret from both the team and the group head, but it uses inputs and parameters determined by the team over the past year and discussed openly in group settings. Recently it has been revealed that this guest is trying to quickly produce a paper on his findings under his name. Is this paper plagiarized? YES. While there are a number of ethical violations to consider here, the team's models and concepts are the foundation of the guest's results. These unpublished ideas were shared with the guest under an implied pact of trust. These ideas would need to be presented for his results to have meaning. But without the team's consent for him to use this, he has plagiarized the ideas.]

Explanations and Recommendations

If one's own text or graphic is reused in a publication or widely disseminated document, it should be presented as a quoted passage with attribution to the earlier work.

Reuse of a small amount of text for limited purposes, such as a technical description of theoretical or experimental methods, is acceptable if the first instance of its publication is cited.

Reuse of one's own text for confidential documents such as research grant proposals is acceptable.

Slides and posters prepared for presentations should credit the source of any figures or charts taken from other works.

When materials are published under licenses that allow reuse, such as Creative Commons licenses, authors should respect the conditions for reuse and attribute credit appropriately.

V. Peer Review

Ethics Standard

Peer review is the accepted process for evaluating research or proposals for research by one or more people with similar competencies as the producers of the work, so-called peers.

Anyone engaging in peer review, whether acting as a reviewer, editor, author, or proposer, is expected to act honestly and ethically to ensure integrity in physics research, so that the quality of publications is not compromised.

Explanations and Recommendations

All steps in the peer review process should be executed as expeditiously as possible by reviewers, editors, authors, and proposers. The process must be rigorous and insulated from undue influence that would interfere with editorial independence.

It is an ethical breach for reviewers, editors, or anyone else consulted during the review process to use materials shared with them for any purpose other than evaluating the materials. Making use of confidential information in this way provides an unfair advantage and undermines the peer review process.

Reviewers and editors should disclose conflicts of interest resulting from direct competitive, collaborative, or other relationships with any of the authors or proposers, and avoid cases in which such conflicts preclude an objective evaluation. (See Conflicts of Interest and Commitment below.)

VI. References in Scientific Communication

Ethics Standard

References within a scientific communication make it possible for readers to access, and for authors to attribute, relevant prior work in the scientific literature. Proper referencing gives credit to those whose research has informed the work in question, helps avoid duplication of effort, and increases the value of a paper or other communication by guiding the reader to related materials.

Authors are expected to make every effort towards comprehensive referencing to give a balanced view of the history and progress of a field.

Explanations and Recommendations

Proper and complete referencing is an essential part of any physics research publication. It is unethical for authors to knowingly omit references to a relevant author/publication, include gratuitous references, or manipulate citations.

Reference lists should represent the entire field and avoid favoring specific research groups, regions, or institutions [or specific journals. Indexed and recognized journals are to be treated equally in terms of their reference value].

VII. Policies for Handling Allegations of Research Misconduct

Ethics Standard

Research misconduct damages the research enterprise, eroding trust and slowing progress to the detriment of all.

Institutions and organizations may establish their own policies and procedures for handling allegations of research misconduct, in compliance with legal requirements. [N/QTL] members are expected to be aware of and fully adhere to and support [WFU's] policies and procedures to uphold the integrity of [WFU] and the broader scientific enterprise. [Responsibilities can be found at <https://drive.google.com/file/d/18plsm-LGN82EVe5f1Gld1vsGpFz687b3/view>. As a matter of policy, N/QTL submits all allegations of research misconduct to the Office of the Provost at Wake Forest University. We are bound by the rules, regulations and process of that office]

Explanations and Recommendations

A person who witnesses a colleague engaging in research misconduct is obligated to act in accordance with institutional requirements. Institutions must protect such reporters so that they do not suffer reprisals or retaliation. At the same time, misconduct investigations require a fair and systematic approach to assessing and responding to allegations.

Researchers should adhere to governmental policies on research misconduct, as well as associated institutional requirements. U.S. researchers with Federal support should see the U.S. Federal Regulations on Research Misconduct.

Everyone has a responsibility to be aware of institutional policies regarding research misconduct and ensure that their supervisees are also aware of these policies.

Treatment of Colleagues

I. Explicit, Systemic, and Implicit Bias

Ethics Standard

[N/QTL] values its diverse membership and supports the right of all people to participate in the physics community free from discrimination [or behaviors which might limit their exercise of scientific inquiry where they are so entitled]. [N/QTL] specifically rejects discrimination based upon race, color, national origin, sex, religion, disability, age, gender identity, sexual orientation, political ideology, or any other legally recognized grounds. [N/QTL further recognizes that biases can stem from discriminatory beliefs as well as from preconceptions of power structures within a community. Specifically, biases with regards to the quality of work or the veracity of scientific claims may arise due to factors such as positions of authority within a community, perceived routes of advancement, or potential alliances within a community.]

Members should strive to be aware of their biases and alert to situations where bias can damage colleagues or the progress of science.

Explanations and Recommendations

[N/QTL] strongly encourages members to participate in efforts designed to counteract explicit, systemic, and implicit bias [including biases based upon power dynamics within the group]. This is particularly important for members who engage in the hiring or reviewing of other physicists or write or read letters of recommendation on behalf of other physicists applying for jobs, fellowships, or awards. [It can also play a central role in forming partnerships for engagement and collaboration.]

During decision-making processes, specific tools such as pre-determined qualification lists and interview scripts may be used to mitigate the impact of unconscious biases. [However, there is no substitute for the self-actualization of understanding the origins of such biases and the harm that they do. Concepts and ideas should be judged upon their merits. This is essential for good science. Such judgments should never cede objective evaluation to subjective perspectives.]

II. Harassment

Ethics Standard

Harassment is disrespectful behavior of any kind with the intent or effect of harming, humiliating, and/or controlling another person. [In this context *Sexual Harassment* is a specific violation of ethical and legal codes. It is handled separately from the considerations in this section and is defined specifically by the institution's (WFU) guidelines as well as federal and state law. N/QTL reports any incident of potential sexual harassment to the appropriate bodies within WFU and to the responsible personnel of those involved.]

[N/QTL] opposes all forms of harassment, including those that create an atmosphere in which productive scientific discourse is not possible. Observers of harassment, often called bystanders, have a responsibility to report instances to the appropriate institution. [This includes all behaviors which might limit another's exercise of scientific inquiry where they are so entitled.]

[N/QTL specifically rejects the use of coercive or abject power dynamics, bullying or subversive deconstructionism within the context of laboratory operations, to undermine the weal and means of laboratory activities.]

Explanations and Recommendations

Harassment may include verbal and physical interactions, and the display or circulation of written materials or images, including those communicated via text messaging or social media. It is different from criticism offered in good faith with the aim of advancing science.

Harassment may be based on group membership including race, color, national origin, sex, religion, disability, age, gender identity, sexual orientation, and political ideology.

[N/QTL is an international community of researchers], so it is important to recognize that behavior and language that are welcome/acceptable to one person may be unwelcome/offensive to another. Members must use consideration to ensure that their words and actions are appropriate. This is

especially important for those in positions of authority, since individuals with lower institutional status may be reluctant to express their objections or discomfort regarding unwelcome behavior.

Sometimes, a frank discussion can resolve a conflict without the need for a formal complaint. Preventing harassment is everyone's responsibility. When a member learns of an allegation of harassment, they are responsible to report the information to the appropriate institution. [The obligation to report also applies to sexual harassment.]

III. Treatment of Supervisees

Ethics Standard

Colleagues should always be treated with respect and with concern for their well-being. Supervisors have a special responsibility to supervisees because they oversee their research, education, and professional development. [In this way, the relationship between mentor and mentee is not meant as purely transactional; ie. it is not a boss-employee relationship.]

Supervisors are responsible for ensuring that supervisees have the knowledge and training to perform their work safely, promoting their timely advancement to the next stage of career development, and providing fair compensation and a supportive working environment.

Explanations and Recommendations

Contributions of supervisees should be properly acknowledged in publications, presentations, and performance appraisals. Supervisees who have made significant contributions to the concept, design, execution, or interpretation of a research study should be offered the opportunity to author or co-author any resulting publications.

Supervisors and/or other senior scientists should not be listed on papers of supervisees unless they have also contributed significantly to the concept, design, execution, or interpretation of the research study. Merely providing funding is not sufficient for authorship but should be noted in the acknowledgements.

[Caution: Research Advisors should be extended the opportunity to contribute if they are actively engaged in the funding of your project or your RA (see above). It is unacceptable and unethical to leave your research advisor out of the opportunities in which you are engaging while they provide funding, instruction, and guidance as a research group head, even when it does not seem to you to be directly related to the work at hand. By being exclusory you are using funding in a way that harms the research group as a whole as well as the working environment of the community. You make it less likely that the advisor will work together with other scientists through his/her students in the future, thereby cutting off their opportunities. Your use of the funding in this way typically cannot be reported to the funding agency as work carried out in furtherance of stated goals thereby reducing the potential of renewal and jeopardizing funding for other students. Finally, you harm yourself by denying yourself the opportunity to work with this advisor on this problem and building a relationship with him/her. This is the flip-side of the non-transactional nature of the relationship.

In this way postdocs and graduate students must also accept specific responsibility for the well-being of the community and for the functioning of their relationship with their advisors. Here N/QTL guidelines differ from those of APS in that N/QTL emphasizes the two-way nature of all such relationships. Respect must be granted from both sides. Our policy more closely aligns with that of the Max-Planck-Institut.

Working outside of stated programmatic goals as defined by funding parameters will be considered misappropriation of funds if space cannot be found for the advisor to participate in the activity which leads to publication products or if permission hasn't been granted ahead of time.]

Mentoring of students, postdoctoral researchers, and employees with respect to intellectual development, professional and ethical standards, and career guidance is a core responsibility for supervisors and established senior scientists. Periodic communication of constructive performance appraisals is essential for individuals to thrive in work and research environments. It is the responsibility of any professional physicist who is in a supervisory role to adhere to good workplace practices as they relate to mentoring and performance appraisals.

Supervisors should ensure that students, postdoctoral researchers, and employees are informed as to where they can get help to resolve conflicts, and where they can report harassment, including sexual harassment.

Responsibility to the Profession

I. Ethical Use of Public Funds

Ethics Standard

The acceptance of public funds comes with the expectation that these funds will be spent in the intended manner, one that upholds the public trust in science and in the physics community.

Misuse of public funds represents a serious ethical breach. [As stated above, and as outlined in WFU guidelines, working outside of stated programmatic goals as defined by funding parameters will be considered misappropriation of funds if space cannot be found for the advisor to participate in the activity which leads to publication products. This can extend even to the use of "free time" on weekends, holidays, and evenings. Put simply most universities limit employees and students from doing the same type of work for two different entities.

EXAMPLE 4: A physics student in professor X's lab needs to earn more money. So, they decide to pick up a second job flipping burgers at a local fast-food joint. In this time the student invents a new burger flipper which results in a patent and which is ultimately is patented, paying royalties. Is it ethical for the student to NOT include the university or the advisor on any of this? Yes. So long as the second job was disclosed to the university in accordance with the student handbook. The work being done and its products do not overlap with the general field of expertise being provided by the university. While part of the patent rights to the burger flipper may belong to the fast-food company, they certainly do not belong to the university.

EXAMPLE 5: A physics student in Professor X's lab works hard and puts in a 40 hour week each week for her RA. She is making adequate progress and has passed all classes. She is approached

by Professor Y to work in their lab to do only some specific measurements for that professor over the weekends and at night after work has ended for Professor X. She reasons that she has fulfilled the obligations of Professor X and this is no different from a second job. She believes she has every right to engage with Professor Y in her own free time and Professor Y will provide some income through a consulting relationship. Is this ethical? No. This behavior is rejected not only by most universities' guidelines, but also by the professional societies of most fields. It doesn't matter if Prof. X and Y are in the same school or department. It is not that Professor X is claiming all of the student's time as his/her own. Instead, the problem here is that the mentor-mentee relationship is being subverted. The student is not just an employee and their responsibilities extend beyond just 40 hours per week. Working for Professor Y was made possible by the work and trust of Professor X.

Notice that the difference in the two examples given seems to center on the type of work being done, and this is quite typical with any employer. It comes about in academia because of its non-profit, educational status. If the student of Example 4 was a food science student for instance, then there could also have been complications unless details of the work-release are worked out in advance. Similarly, the student of Exercise 5 could approach her advisor to ask for release to do this work, but shouldn't be surprised if it is not given. Moreover, consulting pay is managed by the university so university permission should also be sought.]

Explanations and Recommendations

All research funding sources must be accurately reported at the time of a grant application. When there are multiple sources of external support, research time allocation must be accurately apportioned between projects and truthfully reported to project sponsors.

Requesting grant support from multiple agencies for a project is allowed, but accepting funding for the same research from multiple agencies without full acknowledgement and express approval of the agencies involved is unethical and may have legal consequences.

II. Conflicts of Interest and Commitment

Ethics Standard

Conflicts of interest must be fully disclosed. This allows determination of whether they can be managed or whether the conflicting activity must be discontinued.

Conflicts of commitment include acceptance of projects or roles that are beyond one's available time and resources.

Explanations and Recommendations

Conflicts of interest are matters that, when revealed later, would make others feel misled or deceived, may prevent full attention being paid to one's responsibilities, or improperly influence one's judgment and decision-making.

[N/QTL recognizes that identification of conflicts of interest can be challenging. The designation of specific conflicts is typically unique to a specific university or professional society. And while

such guidelines may not be consistent with each other, N/QTL is bound by those of WFU. Typically, such guidelines are concerned with financial remuneration and gain. The appearance of acting for financial gain either in direct (for pay) or indirectly (for ownership in a company) can call into question the purely objective conduct and presentation of research. It may also subvert obligations toward fellow researchers, advisees and students, and/or collaborators.

It is also important to recognize that those things we deem as “conflicts” continue to evolve as value propositions change and evolve. What was acceptable some years ago may not be acceptable today.]

Conflicts relevant to the publication process must be declared to editors by researchers, authors, and reviewers. Editors should also disclose relevant conflicts of interest to their readers. Editors may need to withdraw from the review of conflicted submissions.

Conflicts associated with awards and promotion decisions are defined by institutional policies and must be disclosed.

III. Dishonor to the Profession

Ethics Standard

Dishonor to the profession is an ethical violation when injurious conduct is likely to bring significant discredit, dishonor, disgrace to the reputation of APS or the scientific community at large. Such conduct harms society and damages the profession.

All physicists have a responsibility to uphold the highest ethical standards. They are accountable to each other and to society at large.

Explanations and Recommendations

Dishonorable conduct includes professional and personal acts that raise questions as to whether a member’s conduct is detrimental to [N/QTL].

Dishonorable conduct is not intended to be a catchall for any purported ethical violation. Instead, dishonorable conduct is reserved for extraordinary and egregious acts or omissions, such as but not limited to criminal offenses and/or convictions related to scientific conduct.

IV. Social Media

Ethics Standard

Standards for social media are evolving quickly. The “APS Social Media and Photography Best Practices” guidance is [available on the APS website].

In general, social media communications should be accurate and not misleading with respect to their content and contain correct attributions to prior work when appropriate.

Explanations and Recommendations

In public outreach communications, wording and images used to describe scientific work should be understandable to the non-specialist, thereby minimizing opportunities for misinterpretation. Claims of impacts to science, technology, and society beyond those that have been rigorously established can be misleading and should be avoided or clearly identified as speculation.

V. Education for Ethics Standards, and Practices

Ethics Standards

Education in professional ethics is an essential part of science education.

It is the responsibility of all scientists to ensure that their students receive education that specifically addresses this area.

[Why? This is not an attempt to define moral or religious belief, or restrict people from their deeply held convictions. Instead, what is defined here is a set of interactions guidelines that are designed to prevent biases and prejudices from undermining the basic work of science. When judgements are based on subjective premises as opposed to objective observations, science may fail to reach correct conclusions thereby eroding public faith in its outcomes. Thus, *ethics* is not just a “be kind to your neighbor” statement but rather a carefully crafted warning that how you treat your neighbor may influence the way in which you do your science.]

Explanations and Recommendations

[N/QTL] will develop, maintain, and disseminate materials to support ethics education and training. The Explanations and Recommendations sections in these standards provide background information, including factors considered in the development of the guideline or reasons underlying its creation. These sections are not controlling in ethics determinations. Instead, they include considerations intended to provide context for how the ethical standard may be applied.

[Sections in red are added by N/QTL in response to sections in black as stated by APS. This document, together with the WFU guide for ethical research, the rules and regulations for WFU faculty and staff, the WFU graduate student handbook, and the WFU student handbook is an *operational standard for ethics* at N/QTL.]

Enforcement of Standards

Purposeful infractions of the standards of ethics should be reported to the N/QTL director or co-director. It is generally the role of the director’s office to make the determination to elevate reports of wrong doing to university authorities, or to address enforcement of standards through direct corrective measures. There are some cases however, wherein such determinations are specified by WFU regulations, as well as federal and state law. For example, allegations of sexual harassment, academic misconduct, or theft of university property must be elevated automatically. When an allegation is elevated to university officials, they shall make determinations of wrong-doing and decide upon corrective action.

When authority rests within the director's office to address an allegation, standard practice requires the director to report infractions and corrective measures taken to members of the N/QTL board and to responsible offices at WFU.

Anyone lodging a complaint/allegation has the right to elevate the incident directly for consideration by WFU for resolution if they feel the director hasn't acted appropriately, or is conflicted in some way. Otherwise, depending on the infraction and who is involved, the matter will generally be settled by the Director of N/QTL. If there exists a conflict of interest, the co-director may act or an assignee designated by the WFU Provost Office.

If findings of fact are in dispute by anyone standing accused of infraction, if enforcement is considered inappropriate, or if questions are raised as to impartiality of the Director's office, an accused may seek redress by requesting a review by the WFU Provost's Office. Such reviews are considered by the Provost's Office, only when sufficient evidence is provided that suggests significantly different outcomes of the original action would be forthcoming. This sets a high bar for appeal and such reviews are solely at the discretion of the Office of the Provost.

Everyone is Bound by this Standard

While in the facilities or on the grounds of N/QTL, faculty, research faculty, staff, postdoctoral trainees, students, exchange students, guests and guest scientists of the WFU community and facility users are bound by the rules and regulations of WFU and these ethical guidelines.

Guests and Collaborators

Guests, collaborators and recharge center users at N/QTL agree to be equally subject to standards ethical of behavior pertaining to N/QTL activities external to the lab. Specifically, use or dissemination of concepts, ideas, information, data or any other unpublished research products deemed to be the property of N/QTL members is strictly forbidden.

Guest positions and/or collaborations for the purposes of technological development, do not imply proprietary ownership of scientific work products at N/QTL even when activities are jointly covered by existing contracts and agreements. N/QTL recognizes a distinction between *Patent Rights* which refers to the *rights of use* of specific technological properties and the rights to publish non-patentable research results. The second is reserved to the whole research team as owners of the products of the scientific endeavor. It is typically not controlled by grantors and/or agencies. Moreover, disclosure of research results or information without prior approval and before public disclosure by N/QTL research team members will be considered a violation of these standards and may lead to a termination of existing relationships.

Users

No claim of rights is made to the results, outcomes, or products of recharge center users.

Acceptance of Standards of Ethics

This document has been reviewed by the following representatives and assignees of Wake Forest University.

Dr. Fred. Salsbury	Prof. of Physics and graduate student coordinator
Dr. Martin Guthold	Chair of Physics
Dr. Timo Thonhauser	Co-chair of Physics
Dr. Siegmar Roth	Adjunct Physics WFU, MPI -Stuttgart (emeritus)
Dr. David Carroll	Director N/QTL
Dr. Swathi Kadaba	Research Assistant Professor Physics
Mr. Tim Carlson	Graduate Student Physics
Rev. Bob Summers	Business Advisor N/QTL and WFU Alumni

This document was posted on the WFU-Nanotech website for public comment June 9th 2025.
It has been accepted by the board of N/QTL and enacted June 16th 2025.