

Shifting Culture Towards More Shared Equipment in Collaborative Spaces in Ramaley and Gold/Porter for EBIO, MCDB, and IPHY

By Kathryn Ramirez-Aguilar, Ph.D. & Dustin Quandt

Short Experiment Funded by Innovation Buffs, Strategic Resources and Support, Office of the Executive Vice Chancellor and Chief Operating Officer

BioCore Manager: Dustin Quandt, Shared Laboratory Equipment Manager, dustin.quandt@colorado.edu

Original team:

Kathryn Ramirez-Aguilar, Ph.D., CU Green Labs Program Manager, kramirez@colorado.edu

Stacey Smith, Ph.D., EBIO Faculty

Scott Taylor, Ph.D., EBIO Faculty

Deane Bowers, Ph.D., EBIO Faculty/Chair

Christopher Lowry, Ph.D., IPHY Faculty

Pei-San Tsai, Ph.D., IPHY Faculty

Corrie Detweiler, Ph.D., MCDB Faculty

Bradley Olwin, Ph.D., MCDB Faculty/Associate Chair

Edward von Bleichert, CEFP, FM Sustainability & Resiliency Program Manager

Additional team members:

Katie Clark, EBIO Office Manager

Jennifer Law, IPHY Manager of Operations

Paula Yamashita, IPHY Research Manager

Contents

- I. Summary 2
- II. Key Metrics of the Project (May 1, 2018 through April 30, 2019) 4
- III. Project Overview 5
- IV. Achievements, Progress, and Expanded Scope 6
- V. Fulfilling a Need on Campus 8
- VI. Fifteen Reasons Why the BioCore and Other Managed, Shared Research Equipment Resources Benefit Campus 9
- VII. Future Directions for the BioCore..... 11
- VIII. What If the BioCore Does Not Continue? = A Step Backwards 13
- IX. The Financial Benefits of the BioCore Far Exceeds Annual Costs 13
- X. Grant Budget Review 14
- Appendix A: Comments From Researchers and Staff Who Work with the BioCore 16
- Appendix B: BioCore Policies 19
- Appendix C: BioCore Procedures Developed During the Project 20
- Appendix D: Scenario 1 - Suggested Framework for Repeating Project 22
- Appendix E: Scenario 2 – Suggested Framework for Expanding Project to Other Departments and Institutes 25

I. Summary

This project is a demonstration of the untapped potential that exists at the University of Colorado Boulder for more optimized use of existing laboratory equipment resources to benefit avoided costs and improved scientist access to research equipment. The stimulus funding from Innovation Buffs grant was instrumental in providing three departments (MCDB, IPHY, and EBIO) with the opportunity to experience the advantages of shifting their culture towards more shared equipment. Importantly, a manager was hired to lead this process to not only identify, organize, and oversee shared resources, but to raise awareness of the shared resources and act as a point of contact to help laboratory members find equipment throughout the three departments. This project led to the formation of the BioCore which, after one year, manages 85 shared instruments being utilized by 60 researchers from 18 laboratories. In particular, this grant enhanced equipment sharing for less-expensive, major equipment that many individual laboratories are typically able to afford on their own and, as a result, is less commonly shared in research departments compared to very expensive equipment resources. Furthermore, the project proved to be a benefit to campus research administration working in property accounting and equipment compliance with federal regulations.

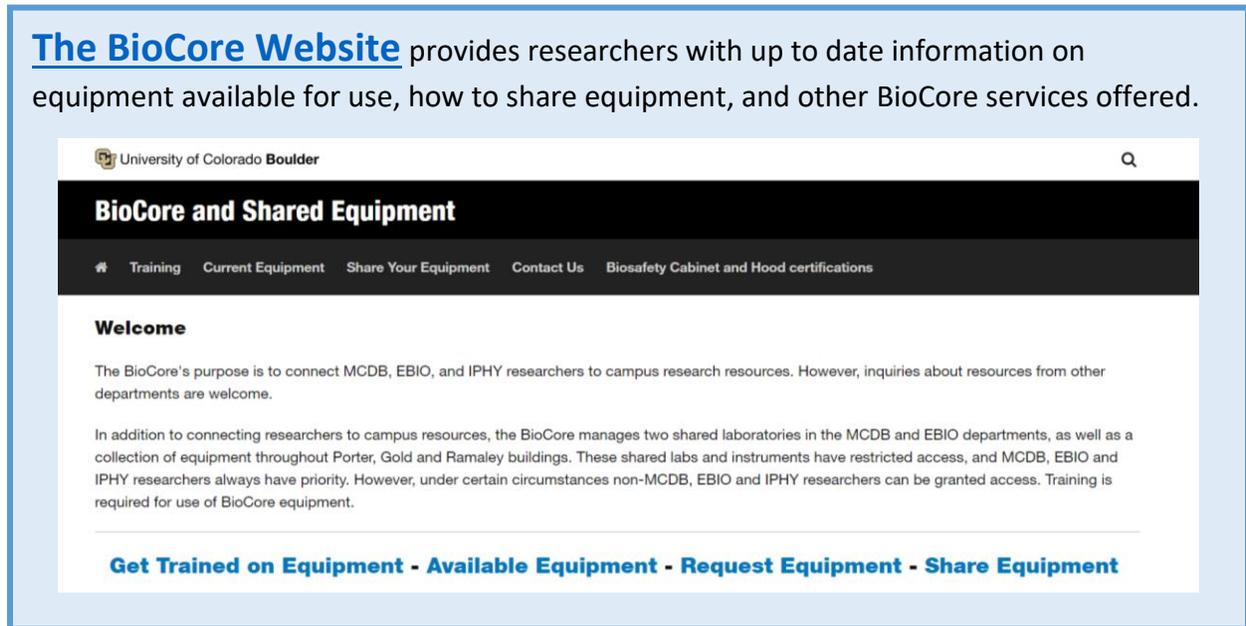
In just one year, the project demonstrated more than double the seed grant amount in avoided equipment purchase costs alone (\$221,000 in avoided equipment costs). This number does not take into consideration many other avoided costs such as saved researcher time (estimated at \$39,000 for the first year), better lab space utilization, and reduced electricity needs from avoiding duplicate equipment purchases. 2115 sq. ft. in laboratory space was made useful again by removing underutilized or unneeded equipment and property from labs in Ramaley and Porter/Gold. Actions like these help to lessen the pressure to expand laboratory space which is a large financial benefit to campus when considering that new construction costs for 2115 sq. ft. of laboratory space is estimated at more than \$2 million in 2019. Importantly, the most essential component of the project which led to these avoided costs above is the hiring of the shared equipment manager. Without the manager, the extent of success of this project would not have been possible.

To continue the momentum of the BioCore and this project, it will be important to determine how funding for the BioCore, and especially the BioCore manager position, will be sustained in the future. Additionally, with all that has been learned through this process of setting up the BioCore in MCDB, EBIO and IPHY, now is the time, if additional funding can be found, to take advantage of that knowledge to more easily expand/repeat this effort and establish additional staffed, shared equipment spaces in other research areas of campus.

Leadership on campus has expressed interest in continuing to grow research at CU Boulder, including substantial growth in the annual research dollars awarded to campus each year. In our opinion, research growth at CU Boulder will be much more achievable if campus looks to

utilize its resources more efficiently and effectively, including research equipment and lab space. As demonstrated by the success of this project, support for managed, shared equipment is a pathway to efficiency, improved research conditions, improved compliance, and cost avoidance.

[The BioCore Website](#) provides researchers with up to date information on equipment available for use, how to share equipment, and other BioCore services offered.



II. Key Metrics of the Project (May 1, 2018 through April 30, 2019)

Research Equipment:

- 85 shared instruments are managed by the BioCore, either in shared spaces or individual faculty labs
 - Importantly, the manager partners with administrators to ensure compliance with federal regulations.
- 20 surplus instruments have been redistributed
- 7 non-functional instruments have been repaired for \$2,233, saving over \$22,000 if labs had to buy this equipment new
- At any given time, >50 additional instruments are being assessed for disposal, repair, redistribution to other labs, or placement in the BioCore shared spaces.
 - Communication with administrators results in accurate equipment tracking and compliance.
- \$625,000* is the estimated value of equipment resources managed by the BioCore
 - * Estimate taken from lower-end resale value from online retailers of used equipment. The actual value is expected to be higher as some equipment is practically new or in very good condition. New equipment is often 2-4 times more valuable than used equipment.
- 4000+ instruments in EBIO, IPHY, and MCDB have been inventoried and added to a database of shared and non-shared equipment

Laboratory Space:

- 2115 sq. ft. of lab bench and floor space freed in labs by removing underutilized instruments and furniture
 - Lab space of this size would equate to more than \$2,000,000 in new construction costs based on information provided by Facilities Planning in CU Boulder Planning, Design and Construction (1,000 of actual square feet (ASF) of new laboratory space is ~1,800 gross square feet (GSF) which is \$1.3M in construction costs, or \$1.6M in total project costs).
- BioCore has 1770 sq. ft. in two lab spaces dedicated for shared research equipment and an additional 465 sq. ft. of space is dedicated as an equipment handling space, to screen equipment for usefulness, repair, and disposal

Lab Participation:

- 18 faculty research laboratories with an estimated 60 researchers have user agreements with the BioCore
- 12 faculty labs are enabling access to their equipment via the BioCore, without officially donating the equipment to the BioCore

Avoided Equipment Costs:

- \$135,500 in avoided equipment purchase with start-up funds as a result of the BioCore, confirmed by three new MCDB faculty and one new EBIO faculty (average of \$34,000/new faculty member)
- \$85,500 in one-time cost avoidance for surplus equipment provided to individual faculty labs that would have otherwise been purchased

Time Saved by Researchers:

- Estimated value of \$39,000 in time saved by researchers as a result of support received and tasks performed by BioCore
 - Assuming \$13,000/year per 6 labs using data from [this case study](#).

III. Project Overview

Initial proposal: The goal of this project was to enhance equipment sharing within Gold/Porter and Ramaley for MCDB (Molecular, Cellular and Developmental Biology), EBIO (Ecology and Evolutionary Biology), and IPHY (Integrative Physiology) departments for the benefit of research, efficient equipment utilization and improved lab space utilization in these buildings. In our project grant application (Fall 2017), our group expressed “that hurdles preventing enhanced equipment sharing from progressing culturally in departments could be overcome if trial, stimulus funding was granted.” Awarded grant funding was used for two main purposes: 1) to pay for repairs of donated lab equipment and 2) to hire a shared equipment manager.

Hiring a shared equipment manager: Together the project team, with the support of additional staff, worked to create a job description, post the position, interview finalists, and then hire an equipment manager for the BioCore, Dustin Quandt. Dustin started his position on May 1, 2018 which is when the clock officially began for our one year experiment.

Shared equipment manager creates the BioCore: Since there is no template process at CU for establishing a new shared equipment facility in a short timeframe by pooling together and coordinating access to existing equipment from research labs in a particular area of campus, what couldn't be learned from looking at other shared equipment facilities, needed to be developed from scratch. With information learned from a Green Labs tour on various campus models for shared equipment facilities, efforts started right away to establish shared equipment spaces and encourage sharing among MCDB, EBIO and IPHY. Two spaces, one in Porter and one in Ramaley, were the focus of early efforts. In one space, the manager began to sift through equipment donations collected prior to the manager's hiring. In the other space which had already been a shared equipment space for many years (but without a manager), old equipment, chemicals, and unneeded items were removed. In both cases, this freed up space so shared equipment resources could be expanded in the spaces.

“The BioCore project has been a huge success with numerous benefits for researchers in our department. Through the BioCore, we in EBIO now have access to a much wider range of equipment along with training on this equipment. This sharing helps to alleviate our space crunch in Ramaley and give new faculty access to bench space while they are waiting on renovations. It also helps us to avoid unneeded equipment purchases.”

Stacey Smith, Ph.D., Assistant Professor, EBIO

The BioCore manager soon discovered that a lot of the information and data needed to build the BioCore wasn't available. So, while work was being done to set up the spaces in Porter and Ramaley, the manager also began efforts to collect the information such as creating lists of existing equipment within the three departments and their exact locations. This led the BioCore manager to also voluntarily take responsibility for the property manager role in EBIO and MCDB. Although taking on the property manager role increased work load, it also was more efficient for tracking equipment and pairing researchers with requested resources. Plus, cleanout of lab spaces is an important aspect of this BioCore project and that fits well with the role of the property manager. Removing unneeded equipment and other property from spaces is one process that

has begun during this past year. The opportunity certainly exists to do more of this. It will be a long term effort to clean out spaces.

While in the role of property manager, the BioCore manager also found opportunity for collaborative work with the Office of Contracts and Grants (OCG) and the Campus Controller's Office (CCO) to improve compliance and keep university lists of equipment accurate. A plan was put into place on how to effectively work together. If this project is repeated elsewhere on campus, one suggestion would be for the manager to take on the role of the property manager and establish a working relationship with OCG equipment compliance and CCO property accounting earlier in the process.

Another important role that the BioCore manager has been fulfilling is conducting outreach to faculty, staff, and students in EBIO, IPHY, and MCDB about the BioCore through email, announcements at meetings, presentations and tours. Importantly, this includes outreach to new research faculty, staff, and graduate students as they arrive on campus, and instructors of teaching laboratories. For example, the BioCore shared equipment manager has been participating in new graduate student orientations by providing presentations and tours to new graduate students.

Defined process for repeating project on campus: The experience that has been gained by conducting this experiment will be useful when repeating or expanding this project elsewhere on campus. By taking advantage of knowledge gained and procedures and policies put in place for the BioCore (see Appendix B & C), it will be possible to use a more defined process to repeat or expand this project with more ease and speed. As a result, similar results likely could be achieved in less time.

IV. Achievements, Progress, and Expanded Scope

Meeting proposal expectations during our one-year experiment (May 1, 2018 to April 30, 2019): Without a doubt, as reflected by the metrics provided above, equipment sharing has been greatly enhanced within these three departments, and, importantly, it has been enhanced between these three departments—across departmental lines—an approach that was embraced by all three departments. The project has benefited improved organization, access to, and awareness of shared equipment resources. Some of these resources are equipment from individual labs while others have been informally shared for many years. The process of purging laboratories of unneeded or underutilized items has also begun, freeing up space and making that space useful again. Furthermore, the BioCore is helping to facilitate a collective, community approach to meeting additional equipment needs in these departments, rather than each scientist looking to have their own equipment in their individual lab.

Within the first couple of months of having Dustin in the shared equipment manager role, researchers in the three departments were reaching out to the BioCore and starting to utilize different equipment within their home department and across departmental lines. Over time, this endeavor expanded and strengthened as researchers were connected to needed equipment with increasing frequency due to the BioCore.

At the one-year mark, the BioCore is still growing. Both new and established researchers are contacting the BioCore seeking equipment and resources, researchers familiar with the BioCore make it their go-to stop when they seek access to equipment or furniture, an equipment repair/recirculation program has

begun, and the BioCore is becoming known across campus via word of mouth as researchers from other departments regularly request BioCore resources.

Equipment sharing culture is shifting as a result of this project: When our team received this grant, a faculty member mentioned that this must be the direction that campus leadership wants us to go. Thus, the very existence of this funded project is sending a message. It certainly provided the opportunity for CU Green Labs, and then Dustin as the shared equipment manager, to encourage faculty and other labs members to shift culture towards shared equipment. In fact, the openness and willingness of many faculty and labs to donate and share equipment resources has been impressive throughout this project and with much less resistance to change than expected.

Likely one of the biggest reasons that this cultural shift is occurring is because of the positive benefits to research that scientists are experiencing in connection with this project. This can be seen through the numerous positive comments received in connection with a request for feedback for this report from faculty, staff, and students who have worked with the BioCore at some level over the past year (see Appendix A).

Equipment manager assumes property manager role for MCDB and EBIO to maximize impact and benefit decision about how to best meet equipment needs:

In the role of Property Manager for MCDB and EBIO, the BioCore manager is directly connected to all incoming and outgoing equipment, furniture, and other resources. This has allowed the BioCore manager to coordinate equipment throughout both departments in various scenarios, such as: making the best decision when to dispose of equipment versus repurposing for continued use, cataloging researcher requests for equipment and pairing available resources with those requests, and ensuring resources remain available when demand exists but is not apparent. Within this role, the BioCore manager has also been active in freeing up building and lab space by being proactive to remove equipment and furniture that has remained in departments long after its useful life has ended.

By taking on this property manager role, the BioCore manager is involved in the screening of equipment (and property) for disposal and notified of all capital property entering the departments, which maximizes the BioCore's ability to strategically enhance sharing in the departments among other actions such as helping with lab cleanouts which benefit improved laboratory space utilization.

In addition, the BioCore manager is maintaining a list of all equipment throughout MCDB, EBIO, and to a large extent IPHY, working with Property Accounting to keep their lists accurate, streamlining the equipment and furniture disposal process with Property Services for researchers, screening equipment meant for disposal, assisting departments with laboratory cleanouts when faculty leave the university, and helping faculty make informed decisions about purchasing equipment based on available resources.

The BioCore manager has been piloting a new cost avoidance mechanism (and potential income source) by redirecting broken instruments toward a local repair technician. Currently the total costs for this experiment is \$565, however the cost avoidance to research labs is at about \$23,000. This program has great potential.

Expanded scope of project benefits research equipment tracking and compliance: As this project has progressed and compliance requirements associated with the BioCore operation have come up, it has become clear that the shared equipment manager could play a noteworthy role in supporting equipment compliance and property tracking with CCO and OCG for the participating departments. Research equipment compliance is important for CU Boulder’s good standing with research sponsors, particularly the federal government that typically funds 70% of all research on campus. The problem that CCO and OCG frequently face with research equipment compliance is that researchers are generally not aware of the restrictions placed on equipment when purchased with grant or contract funding. Also, CCO Property Accounting is often not notified when capital equipment is moved or disposed of, which causes many inaccuracies in CU Boulder’s property database.

“Dustin has been very effective and efficient with helping CCO in its compliance and accuracy with tracking and accounting for BioCore equipment. Having a dedicated or partially dedicated property manager for this and other departments (EBIO, MCDB) is extremely helpful to CCO to complete accurate and organized inventory reviews.”

Andy Settle, CCO Property Accounting Specialist

The BioCore is now working directly with the Property Officer for OCG, CCO Property Accounting, and the Facilities Management Distribution Center (Property Services) to ensure that equipment usage follows all rules. Whenever instruments pass through the BioCore, the Property Officer with OCG and CCO Property Accounting are contacted to inquire about restrictions that may exist for different types of users that may want to access the equipment. Restrictions are followed, reducing the likelihood that CU will unknowingly breach federal regulations. The existence of the BioCore (and its shared equipment resources) benefits campus compliance with Code of Federal Regulations (CFRs) requiring equipment sharing and avoiding duplicative equipment purchases: 2 CFR 200.313 (c)(2) and 2 CFR 200.318 (d) & (f). An audit of CU Boulder by Department of Defense Office of Naval Research (ONR) demonstrated that compliance with the latter CFRs may be of growing importance to the federal government.

V. Fulfilling a Need on Campus

Migrating existing equipment to become managed, shared resources to be accessed by many researchers: This project advances movement toward a culture of shared research equipment resources and away from a culture where principal investigators (PIs) have their own equipment in their own individual research space. It is transitioning existing research equipment resources accessed by a small number of researchers into managed, shared resources that can be accessed by many researchers. *CU Green Labs is unaware of any other effort on campus fulfilling this need and incentivizing this transition.* While some of the targeted equipment may be expensive instruments, most is usually in a price range that individual PIs can afford. It is these less-expensive, major equipment where there is the most untapped potential for improving shared research equipment on university campuses for cost avoidance and improved space utilization such as that discussed in the CU Green Labs [Case Study of the Biochemistry Shared Cell Culture Facility](#) at CU Boulder. Because it is not an easy cultural shift for departments to make when significant costs are required by a department to just try the idea, the grant funding provided for this short experiment has proven to be essential for stimulating this change and

providing an opportunity for scientists to experience the benefits before committing departmental and PI funding toward the effort. In our opinion, it is unlikely that this transition would have moved at as fast of a pace as experienced in this one year experiment without the funding. After all, the funding provides an opportunity to engage people together around an idea and leverage the best proposal possible.

Connections to campus visioning: This cultural shift toward support of more shared research resources is in line with campus visioning efforts such as *Financial Futures*, *Strategic Facilities Visioning*, and *Academic Futures* because shared equipment resources (with a manager) benefits cost avoidance, attracts talented scientists to CU Boulder, and can bring in additional grants. It also can lead to better lab space utilization, and provides access to resources for scientists and academia in support of interdisciplinary research and academics. The BioCore manager is currently active in a Financial Futures project aimed at increasing the visibility, connectivity, cost avoidance, revenue and capacity of the CU Boulder shared equipment facilities. A project that Financial Futures could also consider is repeating or expanding the work of the BioCore to reach other areas of campus where opportunity is waiting.

VI. Fifteen Reasons Why the BioCore and Other Managed, Shared Research Equipment Resources Benefit Campus

From avoided costs & revenue generation to campus mission and compliance, there are many reasons why promoting and growing managed, shared research equipment resources, such as the BioCore, will benefit CU Boulder.

Cost Avoidance

1. **Efficient purchasing:** Shared equipment facilities help avoid duplicative equipment purchases and enable scientists to make better use of the resources we already have on campus.
2. **Space Utilization:** Better space utilization minimizes the need to grow in laboratory space on campus. Lab space is very expensive space to build and maintain and typically energy intense because of ventilation needs.
3. **Strategic use of start-up funding:** Instead of start-up dollars leaving campus when new research faculty purchase more equipment resources for their own lab that we may already have on campus, those start-up funds can stay on campus supporting existing shared equipment facilities and even expanding the equipment capabilities of those facilities.
4. **Time savings for researchers:** Managers of shared equipment facilities save researcher time by helping them locate the equipment resources that they need and taking care of logistics that would pull them away from research (such as maintaining equipment and training new equipment users).
5. **Access to expertise:** Managers of shared equipment facilities provide expertise to help with experimentation and trouble shooting. Skills and knowledge are transferred far more efficiently to researchers.
6. **Recruitment:** Shared equipment can attract top scientists to campus and enable them to get started faster by providing immediate access to a wide range of resources and expertise. It takes a long time for a new faculty member to set-up a lab for research. With access to the

- right shared resources, getting started faster also means being able to *start writing grant proposals sooner*.
7. **Energy and resource efficiency:** By not duplicating equipment resources unnecessarily and using lab space more efficiently, energy and resources are utilized more efficiently on campus.

Revenue Generation

8. **Expanding research capabilities and grant opportunities:** Shared equipment facilities provide scientists with access to equipment resources that they would otherwise not have, thus opening the door to greater research capabilities and more grant opportunities.
9. **External funds captured:** Providing appropriate locations for external users (such as companies and collaborators) to access managed resources for a fee brings in outside dollars which furthers support of shared equipment resources and research on campus.

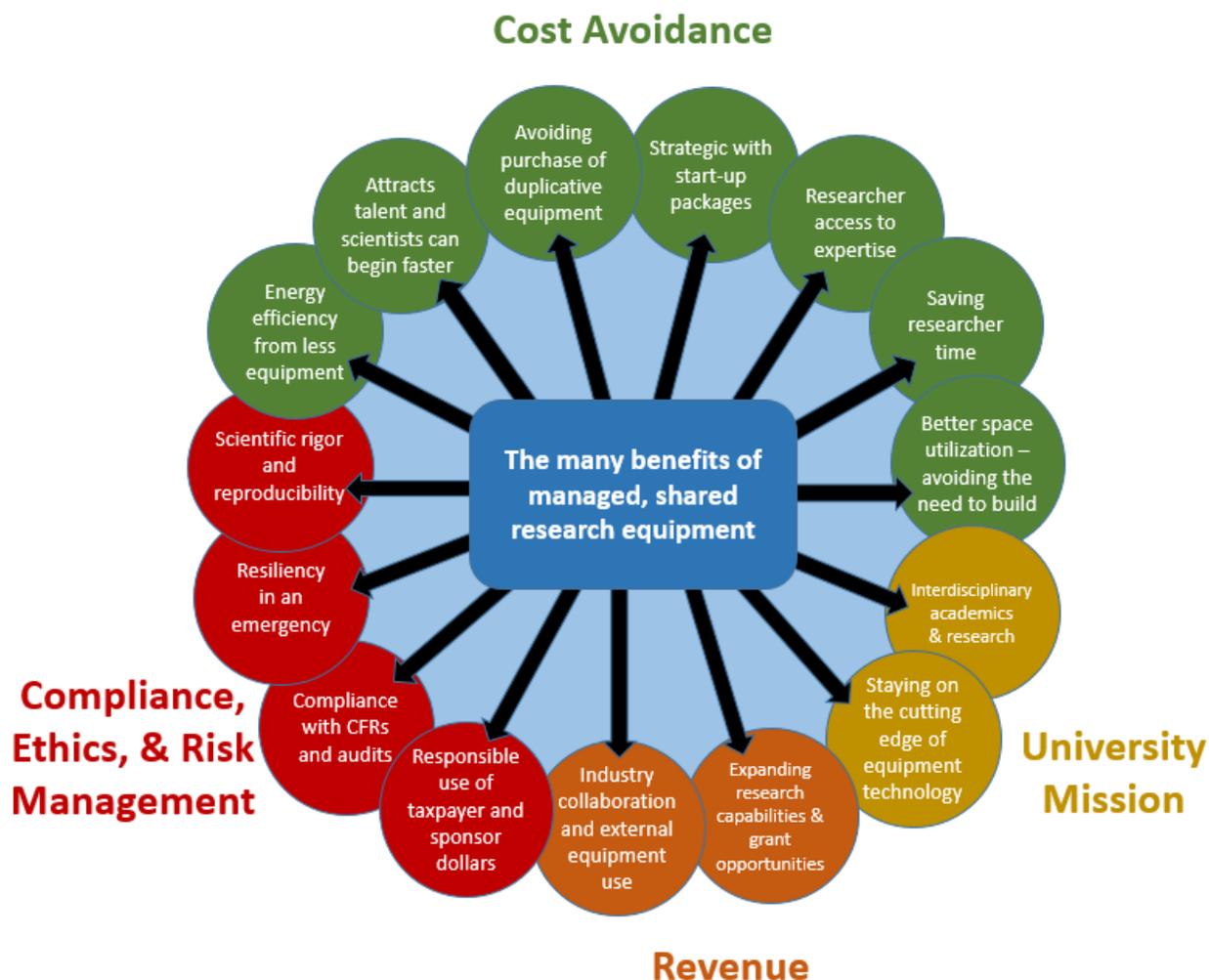
University Mission

10. **Staying on the cutting edge of technology:** The latest technology in research equipment can be more easily afforded when a pool of researchers are using a shared piece of equipment rather than many using each of their own. This also reduces the number of service contracts needed (and associated costs) since there are fewer pieces of equipment.
11. **Academics:** Opportunities for classes and students to access equipment for learning experiences is simpler when equipment is in a shared facility with a manager, rather than tucked away in an individual lab. The manager can provide trainings to individual students or to an entire laboratory class.

Compliance, Ethics, and Risk Management

12. **Compliance:** Shared equipment facilities demonstrate campus compliance with Code of Federal Regulations (CFRs) that require equipment sharing and avoiding duplicate purchases where possible ([2 CFR 200.313 \(c\)\(2\)](#) and [2 CFR 200.318 \(d\) & \(f\)](#)). Managers of shared equipment facilities can also serve as key contacts/partners for research administrators to ensure accurate equipment tracking and compliance with other federal regulations.
13. **Resiliency:** Having critical resources co-located in shared spaces enables campus to better prepare for emergencies and better plan for building spaces that are a priority for back-up power infrastructure in case of an extended loss of electrical power.
14. **Rigor and reproducibility:** This has become [an increasingly important topic to NIH](#) after publications demonstrated that only [about 50% or less of life science research could be reproduced resulting in \\$28 billion/year spent in the US on research that is irreproducible](#). While there is great pressure to complete research and publish among scientists working in faculty labs, the pressure on managers of core facilities is to provide outstanding science and service. Thus, at the 2019 [Association of Biomolecular Research Facilities \(ABRF\)](#) conference, some universities presented that they are looking to cores to help their universities meet the increased scrutiny and pressure from research sponsors for scientific rigor and reproducibility.
15. **Responsible use of taxpayer dollars and demonstrating responsible use of funding to research sponsors:** For the many cost benefit reasons given above, equipment sharing is the right thing to do because it leads to optimized use of taxpayer and research sponsor dollars.

This visual below has been created to summarize the 15 ways that managed, shared research equipment benefit research campuses:



VII. Future Directions for the BioCore

Explore opportunities to repeat or expand this project elsewhere on campus: This project has proven to be a big step in the right direction of benefit to scientists, lab departments (EBIO, MCDB, IPHY), and even administration. Without question, it would be helpful and useful to implement this project elsewhere on campus in other laboratory buildings where a cultural shift and improved organization/access to existing research equipment resources would be welcomed and beneficial. So much has been learned while piloting this experiment (such as the information in Appendix B & C) which

could be applied when expanding to additional areas of campus. One way to expand the impact of this project would be to simply repeat the project. In Appendix D is a suggested framework provided by the BioCore manager for repeating this project elsewhere on campus taking into consideration what has been learned. An alternative to repeating the project would be to grow the reach of this existing project. In Appendix E is a suggested framework provided by the BioCore manager for expanding this current project into additional departments or institutes.

Enhancing connections with academics: The manager of the BioCore has had some initial meetings with teaching staff in both MCDB and EBIO and plans to do more along these lines with all three departments. Shared research equipment facilities, such as the BioCore, can provide an important opportunity for teaching and interdisciplinary academic efforts to improve student education and exposure to technology. Shared research equipment facilities can:

- Enhance the learning experiences of students beyond the typical laboratory classroom. For example, shared equipment managers may provide lectures, tours, demonstrations, and hands-on experiences for instrumentation in their facilities.
- Provide access to equipment resources, that otherwise would not be available to students. For example:
 - Undergraduate students working on senior projects or undergraduate thesis students can access a wider range of tools by engaging with managers of shared equipment to help them.
 - Teaching labs can increase their teaching capabilities through access to equipment via a shared equipment manager.
 - As an example, the BioScience Initiative (BSI) which primarily provides biological research opportunities for undergraduates needed access to an Ultra-Low Temperature (ULT) freezer. BioCore partnered with Green Labs and BSI to secure funding for a shared ULT freezer to be placed in Porter where the BioCore, BSI and other laboratories can now access it.

An entire white paper titled “[Improving research, teaching and innovation via shared equipment resources](#)” was written for Academic Futures (led by CU Green Labs and supported by 12 research faculty and staff who listed their name on the paper). It was referenced in the [final Academic Futures report](#) on page 55. The white paper discusses numerous ways that shared equipment resources could benefit academics and describes how “CU Boulder could have a more positive impact on the fiscal stability of research labs while promoting innovation and enhancing undergraduate, graduate, and postdoctoral learning by making better use of existing shared equipment resources on campus and stimulating the development of more shared equipment facilities.”

Continuing to purge, making lab space productive again while discovering additional equipment resources for scientists to access through the BioCore: During the course of the first year of the project, 2115 sq.ft. of lab space was made useful again by removing unused or underutilized equipment and property. However, this is just the beginning of what is possible in these buildings and thus, these efforts will continue into the future.

Locate permanent sources of funding for the BioCore rather than year to year temporary funding: While permanent funding for the BioCore manager’s position has not been secured, additional funding

received via the College of Arts & Sciences Request for Funds (CASR4F) will support this position through April of 2020. Permanent funding sources continue to be explored. As this exploration continues, an important consideration is that the BioCore is currently directed to work with MCDB, EBIO and IPHY only, although other departments' needs are met when they do not impact the needs of the core departments. If, however, a permanent funding source directed otherwise, the BioCore could more readily open its resources and services to researchers in other departments. This would not only increase the resources available to a wider group of researchers, but would also widen the impact of cost avoidance efforts. Greater impact could be felt across campus if a funding source emerged that did not limit the BioCore's target population. The next two sections make the case for why sources of sustained, permanent funding for the BioCore should be found, even if that involves drawing on multiple sources of support.

VIII. What If the BioCore Does Not Continue? = A Step Backwards

If the BioCore does not continue, it means that there will be a loss of progress made towards more efficient science where researchers have greater research capabilities through increased access to wider range of well-maintained equipment resources, managed in a compliant manner.

- It means a likely return to a less efficient and more costly, individualized way of conducting research where each lab has its own equipment (even if that means duplication and a less optimal use of labs space) and scientist time is pulled away from research to fulfill support roles that the BioCore was providing.
- It means a step backwards in terms of benefiting compliance with federal regulations as well as coordinating the optimized use of limited research funds for strategic purchases of equipment to meet the needs of many labs rather than just a few.
- It means a loss of advancement towards the 15 reasons to support managed, shared research equipment resources listed two sections above.
- It also risks jeopardizing future campus efforts to initiate or enhance equipment sharing efforts because scientists may not trust that it will succeed a second time around. Furthermore, if equipment resources in the BioCore are continued to be shared without a manager, they will not be as well maintained and as a result, scientists may end up having a bad experience with sharing which could contribute to a lack of trust of sharing in the future.

IX. The Financial Benefits of the BioCore Far Exceeds Annual Costs

The many positive comments in Appendix A made by users of the BioCore clearly demonstrates that the BioCore is positively received, having significant beneficial impacts, and that is fulfilling a need. The financial benefits of the BioCore also far exceed the annual costs. For example, the BioCore operating costs and manger position expenses for the first year totaled less than ~\$70,000 (this number will increase some in future years if the equipment manager benefit expenses need to be included). These costs were easily offset alone by the documented avoided equipment purchasing costs which totaled \$221,000. However, the \$221,000 figure is low since there were many additional occurrences where research labs acquired equipment or gained access to equipment through the BioCore manager that have not been recorded or is difficult to track.

In general, the BioCore reduces unnecessary equipment purchases by:

- Improving access to existing equipment (shared equipment and surplus equipment) to avoid equipment purchases by new and existing research faculty
 - New faculty have avoided using startup funds to make purchases of some new equipment to the tune of \$34,000 per new faculty (3 MCDB, 1 EBIO, totaling \$135,000).
- Facilitating a strategic equipment purchases between multiple parties to enable equipment sharing and reduce upfront costs
- Coordinating the repair of surplus equipment

Beyond avoided equipment costs, other reported financial benefits of the BioCore include:

- An estimated \$39,000 in research time saved by:
 - Reducing the time laboratory support staff (graduate students, lab managers, lab techs, etc.) spend purchasing, setting-up, managing, maintaining, and training new users on equipment
 - Utilizing the BioCore’s knowledge of equipment and resources throughout the three departments to quickly connect scientists with the research equipment that they need
 - Providing support and expertise with troubleshooting problems
- 2115 sq.ft. of lab space is de-cluttered and made useful again by purging unused/underutilized equipment and property. Lab space of this size would equate to a value of ~\$2 million in 2019 construction costs for wet laboratories according to Planning, Design & Construction at CU Boulder.
- Improved equipment tracking and compliance, reducing the risk that CU Boulder will unknowingly breach federal regulations.

The financial argument to continue to support the BioCore can easily be made using this data from the first year. Based on financial reasons alone, the hope is that sustained, permanent sources of funding can be found even if that means drawing on multiple sources.

X. Grant Budget Review

Grant funding awarded:

- \$95,000 in seed funding to cover project costs (\$70,000 budget request plus the \$25,000 award)
- \$22,500 in bonuses (a \$2500 bonus paid to each of the original 9 team members)
 - Note: While bonuses were certainly a nice perk, they were not necessary to get this team to propose and carry out this project. Interest in this project came from all of us wanting to make improvements. In fact, most on the team were unaware of the bonuses until it came time for payment.
- **TOTAL FUNDING: \$117,500**

Expenditures for the \$95,000 (May 1, 2018-April 30, 2019):

- \$50,000.04 for shared equipment manager salary
- \$1800.00 for computer for equipment manager
- \$12,898.39 for equipment needs, repairs, and supplies
- \$4622.60 in Facilities Management Work Orders
- **TOTAL EXPENSES (from the \$95,000): \$69,321.03**

**Remaining \$25,678.97 funds to carry over for equipment and operational needs in 2nd year
(~\$10,000 being applied to equipment efforts started before April 30, 2019)**

- The carry-over of this funding will fill an important need since MCDB, EBIO, and IPHY were only successful in finding funding to cover salary costs for the second year.
- There remains a few expenses that are still not settled and will affect the remaining funds left over from the first year. For various reasons, expenses for the efforts below had not yet been applied to the speedtype by April 30, 2019:
 - \$1,000 expense towards the shared purchase of a Green Labs shared ultralow freezer to go into Porter and expand shared resources for MCDB. These funds were matching funds to encourage another group, Biological Science Initiative, to contribute \$1,000 as well.
 - ~\$7,000 will be used to pay for the repair of four growth chambers that are in serious demand for EBIO. These growth chambers are currently being worked on and are expected to be fully functional again in the next month, after several years of unreliability
 - ~\$2,000 for repairs of five instruments that are in high demand. The expense to repair these instruments will be 'sold' back to researchers for 10% on top of the repair cost to recirculate the equipment, save researchers considerable money, and reduce E-waste.

Appendix A: Comments From Researchers and Staff Who Work with the BioCore

- This is an excellent program and a very efficient and cost-effective platform that helps greatly the research of all PIs in the campus. Dustin did a great job! I would suggest to turn this position into a permanent position and provide additional personnel and resource support for the BioCore.
 - Ding Xue, Ph.D, Professor, MCDB
- Dustin and the BioCore have been instrumental in helping me set up a new center in the MCDB department, the Stem Cell Research and Technology Resource Center, which is approximately 1,250 square feet of recently renovated space in Porter Biosciences that is estimated to reach capacity with approximately 42 users/researchers. I have only been Director of the Center for about 6 weeks, and already have been impressed by Dustin's continual enthusiasm and reliability to work with researchers, which has included supplying the Center with a variety of useful used equipment (including a large research refrigerator, desks, bookcases, microscopes, a sturdy metal cart, a printer, a flammables cabinet, and many smaller office and research supplies) that has saved the Center at least \$10,000 in expenses. This has been extremely useful for getting the Center started not only because of it having a rather limited start-up budget, but also because the items are on-hand very quickly; Dustin works extremely hard and efficiently to find an item, if he thinks it's available, and quickly deliver it. From a sustainability standpoint, I also greatly appreciate that old items that could still be of value are being fixed up, re-homed, and repurposed (instead of ending up in a landfill). In addition, Dustin has also been extremely helpful with relocating and setting up equipment from different labs into the Center's space, again playing an important part in helping the Center get rolling.

In the future, I also plan to use some of the shared equipment in BioCore. Again, because of the Center's limited budget, we would not want to purchase expensive equipment we rarely use, but because some occasional assays require such equipment, it will be very useful to have shared access to them. For example, the Center will need to perform monthly mycoplasma testing on cell culture samples, and this requires a qRT-PCR machine or fluorescent plate reader, both expensive equipment items available at the BioCore; it makes much more sense to use this equipment at the BioCore than purchase them when we only need to use them once a month. Similarly, the Center has already started making use of the Shared Ultra-Low Temperature Freezer Program, which Dustin helps manage; this is very useful because the Center does not need to purchase an entire -80C freezer, and only needs some limited space access, making the Freezer Program an ideal and very economical option (renting some space at < \$1/month versus purchasing an entire freezer at >\$10,000!).

- Teisha J. Rowland, Ph.D.
Director | Stem Cell Research and Technology Resource Center
Department of Molecular, Cellular, and Developmental Biology

- The BioCore project has been a huge success with numerous benefits for researchers in our department. Through the BioCore, we in EBIO now have access to a much wider range of equipment along with training on this equipment. This sharing helps to alleviate our space crunch in Ramaley and give new faculty access to bench space while they are waiting on renovations. It also helps us to avoid unneeded equipment purchases. For example, I had planned to purchase a qPCR machine but now that one is available in BioCore, I have crossed that item off my list. Dustin has also prioritized repairing high need equipment, allowing us to make better use of past purchases. This past semester he rehabilitated a refrigerated ultracentrifuge in Ramaley, and it is a dream to have one that works in Ramaley. I got the most gorgeous gigantic balls of DNA thanks to it! Needless to say, we are all keen to find support to continue this fantastic program!
 - Stacey Smith, Ph.D., Assistant Professor, EBIO

- When I realized that I needed to use a lyophilizer for my research, I heard that there was one in the EBIO department that hadn't been in use for a while. I was so happy to discover that it had been integrated into the Biocore and was up and running! Dustin has done a great job of managing this resource and it has been critical to completing my dissertation research.
 - Megan Blanchard, Graduate student, EBIO

- BioCore has made my life so much easier! Thank you! Don't know how we survived before, everything is more efficient and organized. If something is needed BioCore knows where to find it! I'm sure our inventory is much more accurate and stays up to date. Thank you!
 - Jennifer Kinion, Building Manager, EBIO

- Over the past year, Dustin has demonstrated how useful the BioCore can be. He has helped us to find a few items we were in need of and he had some tools on hand that we could borrow to save us both time and money. He is also helping those of us involved in the teaching labs to get an online database set up so that we can more easily share equipment with one another. Dustin is wonderful to work with and extremely helpful. When I encounter a problem related to equipment - whether it needs a repair or needs to be replaced- I now contact Dustin first to see if the BioCore can help us out. I thoroughly endorse the project and hope it is around for a long time.
 - Megan Greening, Lab manager, Han lab, MCDB

- Biocore has been a tremendous resource as I have set up my lab. Part of the value lies in repurposed equipment; we have certainly saved valuable funding by using second hand instruments. However, another important aspect is Dustin's expertise. He has helped us get new equipment up and running. He has facilitated improvements to the lab infrastructure (shelving, furniture, etc.). Dustin has also been a great source of information on vendors and other lab-related services (i.e., certification for biosafety cabinets). Dustin is spearheading research on an imager for Westerns, which parallels our own interest and has been helpful in making our decision. Finally, Biocore itself provides fundamental equipment that we use frequently

(Nanodrop, floor centrifuge, shakers). I am very grateful that Biocore exists and functions smoothly.

- Justin Brumbaugh, Assistant Professor, MCDB
- DEFINITELY appreciate the BioCore! So far, all my interactions with [Dustin] and the BioCore services have been exceptionally positive. Our lab doesn't have a ton of resources and it's extremely difficult as an incoming grad student to know who to ask for what if you need to borrow. Also sometimes it's uncomfortable to ask, or you won't get a response and don't feel comfortable bugging professors about using their equipment. Not only that, but I feel like we get a lot of emails in general about people asking for equipment that most everyone deletes almost immediately. Having it all organized in one place with a designated person has made the process so much smoother and more straightforward. In addition, the fact that [Dustin does] upkeep for machines and have taken stock of things that are free or reusable or just need to be fixed is really economical and green (in terms of reducing waste) in the long run, which I think is great. Anyways, keep up the good work!
 - Alex Alexiev, Graduate student, EBIO
- I am hugely appreciative of the BioCore and particularly the great work that Dustin Quandt has done to make our labs run more efficiently. It has been hugely helpful to have Dustin consolidate equipment and pool various pieces for shared usage. Further, Dustin has gone the extra mile to try to pair folks with an analytical need to a lab that has the equipment to get the job done. If we could institutionalize the BioCore and perhaps expand on the program, it would lead to a lot of reduced costs and redundancy in single user labs. Finally, I want to congratulate Dustin on getting a GreenLabs award. Indeed, so well deserved!
 - Rebecca Safran, Professor, EBIO
- I think the BioCore has been a very good asset to the community of labs in our part of campus. While I have not used it too much, it is good to know there is equipment available to us. The cost of everyone buying their own equipment is prohibitive. For example, our qPCR machine died and we can't afford to repair it; ABI wanted \$4000 just for a phone consultation to diagnose the problem! Having a Core facility makes good economic sense, even if it shifts some of the cost to overhead.
 - Christine Roberts, PRA, Link Lab, IPHY
- The BioCore has been a highly useful resource for our lab, as the instruments I'm using had previously been scattered throughout Porter. Having everything in one place with a single reservation system is a great improvement, and it's contributed to our decision to use the EpMotion pipetting robot for qPCR setup which allows us to use smaller reagent volumes and save money. I hope to see the BioCore continue to receive funding and to acquire additional equipment.
 - Caleb Anderson, Professional Research Assistant, Jones Lab, MCDB

Appendix B: BioCore Policies

User agreement

All users must be covered by a User Agreement – to be agreed to upon by PI's to cover all researchers they take responsibility for. The agreement from PI's to this user agreement is documented via email (no signing).

BioCore user terms: The purpose of this agreement is to ensure that assets within the BioCore remain adequately functional to researchers needs. There are insufficient funds in the BioCore to support service contracts or pay for repairs/replacement for damaged equipment. Therefore, we need the users of the equipment to agree to share the cost of repairs/replacement, proportional to their use.

Do you agree to the following?

1. Share repair costs under normal wear & tear circumstances, proportional to your lab's usage.
2. Gross negligence will be charged to the user's lab.
3. Each user receives proper training. (see [BioCore website](#) for details on training for each piece of equipment)
4. Report any issues and/or malfunctions with equipment right away to biocore@colorado.edu
5. Uses under this agreement include any PI, Post Doc, Graduate student, or undergraduate use on your lab's behalf.

If/when equipment needs replacing, we will deal with this on a case by case basis, conferring with users to determine replacement needs, desires, and limits. Users of the equipment needing replaced are expected to share the cost of replacement, proportional to their previous usage, and dependent on requests from other users for upgraded/downgraded replacement equipment.

Access to BioCore resources

Any researcher within MCDB, EBIO and IPHY has access to BioCore resources and the BioCore manager. A small number of instruments that are shared through the BioCore are only available within a given department due to the 'donor' of that instrument requesting so.

Any researcher external to MCDB, EBIO and IPHY can have access to BioCore resources only if their use of the instruments does not compete with researchers with MCDB, EBIO and IPHY .

There is no charge to researchers to use BioCore resources, whether they are within or external to MCDB, EBIO and IPHY.

Keys are issued to any lab (usually the PI) that has arranged with the BioCore manager to utilize BioCore resources. There are two separate keys, one for Porter B412 and another for Ramaley C335, both of which harbor a variety of shared instruments.

After-hours access to buildings with shared resources is rarely granted, and the BioCore manager does not themselves request this. Each researcher who desires after-hours access makes their own case to the building manager/proctor.

Usage of equipment/resources

Some, not all, BioCore resources are in high enough demand that scheduling ahead of time is required. A scheduling application is loaded onto a computer in each of the shared laboratories the BioCore manages. Users are required to use this application.

On some instruments, signage is posted to describe any scheduling limitations, such as “only available for 30 minute blocks”, “cannot use more than 2 hours per day”, “long exposures can only occur during non-primetime hours”.

Acceptance of new, used or non-functional equipment

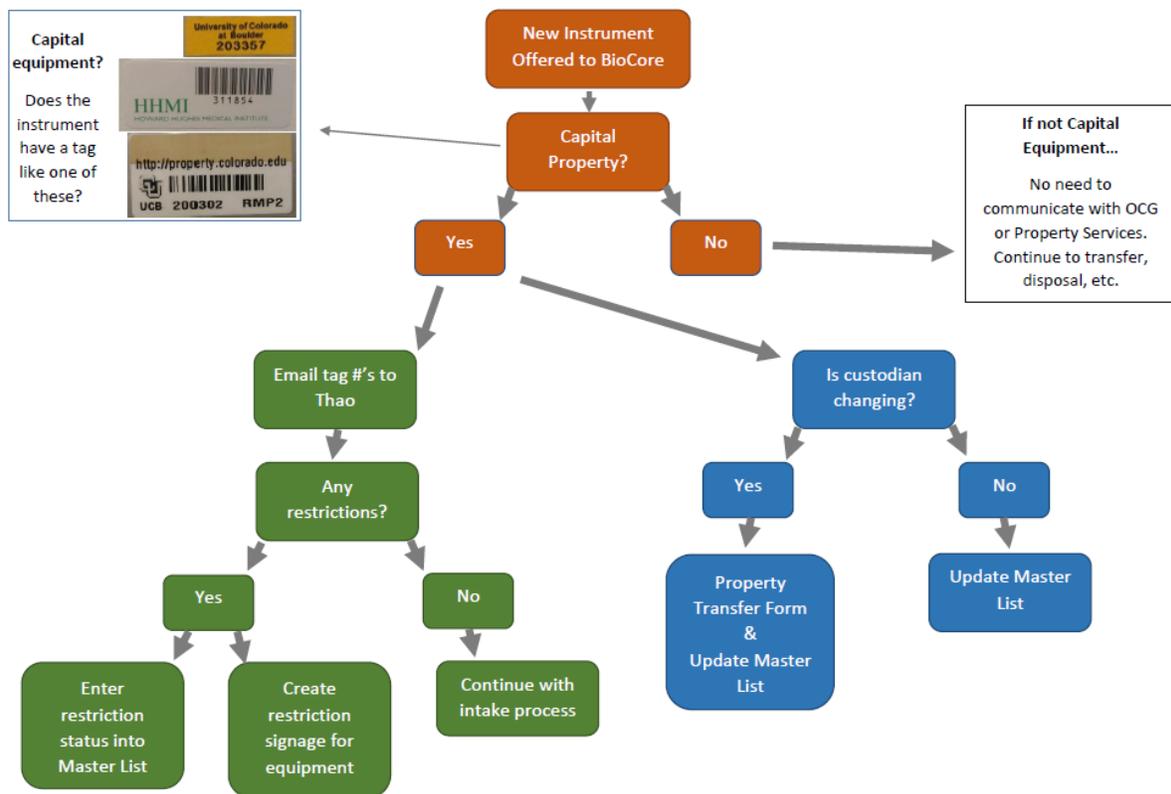
All equipment, regardless of functionality, is accepted by the BioCore manager. Once equipment enters the BioCore, it is vetted for usefulness and if it is in demand and in good condition, it enters the BioCore shared lab space to go into service, or it is kept in storage until needed. Anything that is not in demand or non-functional goes through the various steps in the procedures outlined in the “BioCore Procedures” section of this document.

Storage of equipment

Only equipment that is available to be shared or ‘given’ to the BioCore has the potential to be stored in one of the BioCore’s storage rooms in Porter and Ramaley. Labs cannot store equipment in these storage rooms unless they are willing to let other labs use the equipment

[Appendix C: BioCore Procedures Developed During the Project](#)

Steps for intake of shared capital equipment: See the decision tree graphic below.



Steps for capital equipment disposal: [NOTE: for non-capital equipment, skip to step 3.]

OCG – Office of Contracts and Grants

1. Fill out “Property Disposal Form”
 - a. OCG – Office of Contracts and Grants
 - b. The custodian and owner should get an email confirming, may require signature
2. Fill out EH&S form
3. Upon approval from OCG
 - a. Enter into AssetWorks
4. Place labels on property
 - a. These are received via campus mail from Steve Marvel
5. Email (respond to) Steve Marvel
 - a. “Labels are affixed”

Steps for new researcher or lab requests access to BioCore resources:

1. Determine which department they belong to
2. If within MCDB, EBIO, or IPHY, they get full access.
 - a. Get key issued, if necessary

- b. Organize training, if necessary
 - c. Give overview of BioCore lab scheduling application
- 3. If not within MCDB, EBIO, or IPHY, they may be granted access to a single instrument/resource per their request, but only if their usage does not impede the usage of researchers within MCDB, EBIO, or IPHY and the custodian of that resources is OK with outside departments using their resource.

Steps for when researcher seeks equipment not in BioCore shared equipment pool:

1. Researcher contacts BioCore manager with their need outlined
2. BioCore manager determines if comparable equipment exists in department equipment database (BioCore Master List)
3. Results are returned to inquiring researcher
4. **Only** equipment make, model and condition information is returned to inquiring researcher
5. If location or custodian information is given out at this point, this encourages the inquiring researcher to seek access to the equipment themselves. When this occurs, the BioCore is no longer in control of the interactions between the BioCore users and PI's who possess the equipment, running the risk of misrepresentation of the BioCore and a collapse of partnerships.
6. If inquiring researcher wants to seek any of this equipment, BioCore manager contacts equipment custodian to determine if equipment is shareable
7. If equipment is shareable, the two parties are connected
8. If equipment is not-shareable, other avenues are explored, if possible

Website

A website is maintained (<https://www.colorado.edu/lab/biocore/>) to highlight the various equipment and services the BioCore offers. Content are updated regularly.

Appendix D: Scenario 1 - Suggested Framework for Repeating Project

1. Above all, remember that the individual establishing this facility must create a positive rapport with ALL researchers. Trust, honesty, integrity, and effort will all be judged by every researcher in the department(s). The individual establishing this facility is, above all, a servant of the department(s).
2. Secure dedicated facility space
 - a. >500 ft² made available exclusively for shared equipment (preferably with the option to expand)
 - b. Look at needs of users/department (generally), do they need: fume hood, eyewash stations, bench space, ventilation, dark work space, anti-vibration space, temperature controlled space (e.g. 37C, 4C), etc.
 - c. Recommended – secure storage space outside of shared facility for ‘extra’ instruments and other items acquired throughout facility setup process. This will allow you to keep instruments and other items that are not currently in demand, but may be at some

point. Also allows for storage of broken instruments that may be able to be fixed at a later date.

3. Secure personnel
 - a. At least one dedicated manager
 - i. “Dedicated” meaning: salaried position for an individual to have in their job description managerial responsibilities for the facility and equipment. This would exclude graduate students, hourly staff, and temporary staff, primarily due to lack of permanence which leads to lost knowledge and inconsistent management.
 - b. Offers consulting and training on equipment as part of their role.
4. Ensure entire department is aware of this new shared facility
 - a. Suggest this be done at any faculty meetings, graduate student meetings, and through departmental email lists.
 - b. Suggest to put a face with a name (of the facility manager)
 - c. This will make early interactions with the shared facility manager and researchers easier. For good reason, many researchers are skeptical of new faces walking through their building/lab looking at equipment.
5. Perform instrument audit of department(s)
 - a. Catalog literally every instrument (small to large) within every lab (exclude any lab that shows resistance. Do not develop poor relationships!)
 - b. Purpose: to have current list of all equipment in department to be able to assist researchers with equipment-researcher pairing. This will save a tremendous amount of time as researchers request equipment.
6. Determine best instruments for sharing
 - a. Using the catalog of instruments, develop and utilize the following instrument lists to determine which instruments to pursue as shared resources for this facility:
 - i. Redundant – easier to encourage researchers to share as there are often ‘extras’ and it is apparent many researchers need access to these instruments.
 - ii. Large – Large instruments take up space in PI’s labs. Placing larger instruments in a shared facility frees up space in PI labs, and encourages other PI’s to utilize the shared facility rather than purchase their own large instruments.
 - iii. General support – Standard benchtop instruments that support a wide variety of research allows researchers to utilize the shared facility even more. These instruments help support benchtop work when researchers are utilizing other more specialized instruments in the shared facility.
 - iv. Specialized – Seek these out! Having specialized instruments in a shared facility makes them available to a wide variety of researchers that would otherwise not have access. Making specialized instruments available to an entire department can have a large impact on research.
 - v. Expensive – Many labs cannot afford expensive instruments. Making these available to researchers can allow them to expand the scale and scope of their work.
 - b. Survey department researchers to determine the following:

- i. What instruments do researchers need access to in order to continue their research?
 - ii. What research do they hope to do, but cannot because of a lack of instruments?
 - c. Compare above lists with research interests in department(s), determine which equipment would be best to share and enter this shared instrument facility.
- 7. Develop infrastructure (important to do this before accepting instruments into shared facility)
 - a. Clearly outline the following, via documents, website, or notice board (website preferred). All users of this facility need to be knowledgeable of the following.
 - i. User agreements (see appendix D below for an example).
 - ii. What to do when equipment needs repairs.
 - iii. Scheduling use of equipment.
 - iv. Available consumables.
 - v. Hours of operation.
 - vi. Access to facility.
 - vii. Training on instruments.
- 8. Request instruments from department PIs
 - a. Reach out to PIs for specific instruments believed to be good candidates for sharing.
 - b. Request ANY instruments PIs/labs want to get rid of, broken or functional.
 - c. Accept ALL instruments offered. Sort and redirect.
 - i. Instruments in high demand, consider for shared facility.
 - ii. Instruments not currently in high demand, consider storing for later use.
 - iii. Instruments that are broken, assess for potential to get repaired. A lot of useful and expensive instruments can come from this often neglected category.
 - iv. Instruments that 'just need to go', organize for CU Distribution to pick up. They will attempt to resell items, and a portion of any revenue can be returned to the department or the shared facility.
- 9. Set up shared facility
 - a. Plan lab setup based on:
 - i. Workflow of research when using specific instruments (does a Bunsen burner need to be nearby? How about a BioSafety Cabinet?).
 - ii. Keep 'dirty' instruments segregated from cleaner spaces.
 - iii. If possible, keep noisy instruments segregated.
 - iv. Keep congestion to a minimum on the lab bench, and take into account walking paths researchers will take when visiting instruments.
 - v. Access to instruments that utilize toxic substances (e.g. Ethidium bromide) should be accessible without touching door handles, if possible.
 - b. Office or desk of shared facility manager should be situated out of the way, but easily accessible. Researchers visiting the shared facility should not feel pressured to interact, but should know you are present.
- 10. Build online presence
 - a. Build website, ready for input of instrument names, locations, etc.
- 11. Open facility to researchers
 - a. Only after the above is completed can you open the facility to shared use.
 - b. Opening prematurely can result in incomplete setup of essential infrastructure.

12. Constantly seek feedback and adjust
13. Take on role of property manager, or work closely with property manager
 - a. This allows the facility manager to be aware of all incoming and outgoing instruments
 - b. Can allow for additional services offered through this facility. Such as:
 - i. Work with Property Services to increase efficiencies within their office.
 - ii. Work with OCG to assist with compliance.
 - iii. Handle all property transfers to CU Distribution to help redirect instruments, furniture and other items to be recirculated rather than disposed of.

Appendix E: Scenario 2 – Suggested Framework for Expanding Project to Other Departments and Institutes

1. Identify good initial candidates for joining this project
 - a. Departments that have overlap in instruments/research:
 - i. Chemistry
 - ii. BioChemistry
 - iii. Environmental Studies
 - iv. Geological Sciences
 - v. Atmospheric and Oceanic Sciences
 - b. Institutes that have overlap in instruments/research:
 - i. BioFrontiers
 - ii. CIRES
 - iii. INSTAAR
 - iv. JILA
2. Pitch for the program
 - a. Ensure all members of the departments/institutes are aware of the following:
 - i. General structure of the program
 - ii. Resources handled by the program
 - iii. All participation is voluntary (this program is not going to take all your instruments and deem them sharable!)
 - iv. This program expands available resources

Assuming buy-in from the above departments/institutes

3. Secure dedicated facility space
 - a. Preferably, space within each building where departments/institutes have presence
 - b. Preferably, additional storage space (does not need to be in every building)
4. Determine level of additional facility support
 - a. How many new facility managers or support staff must be hired to accommodate this growth?
 - b. Any new managers and staff must be able to work socially with researchers with a variety of personalities. Intimidated researchers will utilize the facilities less than welcomed researchers.
5. Instrument audit

- a. Catalog literally every instrument in the departments/institutes
6. Determine best candidates for shared instruments
 - a. Compare research needs of new departments/institutes with needs of current departments (MCDB, EBIO, IPHY)
 - b. Identify redundant, unique, large and specialized instruments
 - c. Determine ability of dedicated facility space to house above instruments
7. Request instruments
 - a. Reach out to PIs for specific instruments believed to be good candidates for sharing.
 - b. Request ANY instruments PIs/labs want to get rid of, broken or functional.
 - c. Accept ALL instruments offered. Sort and redirect.
 - i. Instruments in high demand, consider for shared facility.
 - ii. Instruments not currently in high demand, consider storing for later use.
 - iii. Instruments that are broken, assess for potential to get repaired. A lot of useful and expensive instruments can come from this often neglected category.
 - iv. Instruments that 'just need to go', organize for CU Distribution to pick up.
8. Label/track instruments
 - a. As instruments will likely move around campus, determine labeling system to track equipment. Preferably the CU Tags that Property Services utilizes on all Capital Equipment.
9. Set up shared facilities
 - a. Do not duplicate shared facilities, i.e. each lab should be unique with unique instruments and services, however some overlap is OK.
 - b. Determine best fit for acquired equipment dependent on needs of the labs local to each dedicated facility space
10. Refine online presence
 - a. Build website, ready for input of instrument names, locations, etc.
11. Market facilities
 - a. Tours, talks, meetings, etc. Make the facilities known to the researchers that are allowed to use them.
12. Open facility to researchers
13. Constantly seek feedback and adjust
14. Take on role of property manager, or work closely with property manager
 - a. This allows the facility manager to be aware of all incoming and outgoing instruments
 - b. Can allow for additional services offered through this facility. Such as:
 - i. Work with Property Services to increase efficiencies within their office.
 - ii. Work with OCG to assist with compliance.
 - iii. Handle all property transfers to CU Distribution to help redirect instruments, furniture and other items to be recirculated rather than disposed of.