

University Senate Plenary

February 23, 2024



University Senate

Proposed: February 23, 2024

Adopted: February 23, 2024

PROPOSED AGENDA

University Senate

Friday, February 23, 2024 at 1:15 p.m. via Zoom

[Registration required](#)

After registering you will receive a confirmation email with meeting details.

PROPOSED AGENDA

1. Adoption of the agenda
2. Adoption of the minutes of February 2, 2024
3. President's report and questions
4. Chair's report and questions
5. Old business:
 - a. Committee reports and updates:
 - i. Event policy update: [Interim University Policy for Safe Demonstrations](#)
 - ii. Information and Communications Technology Annual Report 2022-2023 (IT)
6. New business:
 - a. Resolutions:
 - i. Resolution to Approve the Establishment of the Roy and Diana Vagelos Institute for Biomedical Research Education (Education)

MEETING OF FEBRUARY 2, 2024

Sen. Jeanine D'Armiento (Ten., VP&S) called the Senate to order at 1:15 pm. Seventy-nine of 101 senators and 125 additional spectators were present during the meeting.

Sen. D'Armiento reminded the group that only senators can speak and vote at plenaries.

Adoption of the agenda. The [agenda](#) was adopted as proposed (see Plenary Binder for February 2 plenary, p. 2).

Adoption of the minutes. The [minutes](#) of December 8 were adopted as proposed (Binder, 3-11).

Executive Committee chair's remarks. Sen. D'Armiento said President Shafik was attending the inauguration of the Barnard College president. It was a busy day and a difficult day to navigate the campus, with these and other events going on.

Sen. D'Armiento said she didn't have much to report that wouldn't be addressed later in the meeting. She invited questions.

Sen. Daniel Savin (Research Officers) asked when the Structure and Operations Committee would meet next. He said the committee had not met since May 2022. There was important committee business that had been put off for far too long.

Sen. D'Armiento agreed that there were pressing issues, and said S&O would meet soon. She noted that the Senate had been extremely busy with other issues that would be discussed later in the meeting.

Old Business.

- *University Event Policy status.* Sen. D'Armiento recalled that the Senate had devoted extensive discussion at the last two plenaries to a revision of the event policy that had been put in place in October 2023. She said the Senate recognized the need for the University to designate time, place, and manner for protests. But she said the policy was confusing because it seemed to bump into the already existing Rules of Conduct covering protests. At the December 8 plenary the Senate approved recommendations for modifications to the new event policy. She said the Senate believes that a policy of this kind must allow free and open debate, while recognizing the rights of others to speak, study, teach, and learn. There must be a framework that is recognized by everyone. She said that in December the Student Governing Board had voted to declare non-cooperation with the new event policy, and she supported that decision. She said the goal now was to make an event policy that everyone could embrace.

She said many senators had continued to work very hard on a revision of the event policy, and they were now nearly finished. She said one of the student senators would say more about this later in the meeting. The goal was to recognize the needs of the University, while maintaining freedom of speech and the right to protest as fundamental priorities.

Sen. D'Armiento said the Senate would not endorse a policy that does not retain an enforcement framework that allows student involvement and due process. She said the University Judicial Board must be included in any policy for events that involve public expression, and in any disciplinary process affecting students' records.

She asked Student Affairs Committee leaders Bruce Goumain (GS) or Minhas Wasaya (Business) to describe the key elements of a revised event policy.

Sen. Wasaya said it is an essential responsibility of the University to protect freedom of expression and the right to protest, while at the same time upholding its academic and research mission, and the right of its members to study and learn without disruption. He said the University is responsible for balancing these priorities by regulating the time, place and manner of protests. Students have engaged in a process of sounding out constituents and other key stakeholders, including administrators, to determine workable solutions. One key step is providing a process for groups as well as individuals to register demonstrations, and lowering the requirement (set by the event policy announced in October) that student groups register their events at least 10 days in advance.

Sen. Wasaya said another important task is finding spaces for demonstrations that will not interfere with normal school business. Students have identified appropriate spaces by looking at where demonstrations have taken place in the past. These spaces are in the vicinity of the Sundial and the lawns on South Campus. Groups would normally register for those spaces, but they could also make special requests for other spaces. Having some degree of consistency in the allotment of space would help to ensure the predictability of the process.

Sen. Wasaya said there should also be predictability in the scheduling of demonstrations.

He said the final issue is how to handle violations of the event policy. This was the problem that Sen. D'Armiento had said particularly requires due process. The Senate group wants to ensure that the Student Governing Board is involved in deliberations about possible violations by groups, and that the University Judicial Board adjudicates any allegations against individuals.

Sen. Wasaya said the point of these provisions is that in the SGB and the UJB students are either partly or completely responsible for adjudication. He said the Senate will not accept any policy without this feature. At the same time, Sen. Wasaya said, the Senate wants to ensure that the University can act swiftly to hold people accountable when they do violate the policy.

Sen. Susan Bernofsky (Ten., Arts) asked about the designated demonstration locations, which reminded her of the "free speech" areas set by the New York Police Department, which involve setting up metal barriers and penning people in little areas that are often dangerous. Is this where the plans for designated demonstrations are headed?

Sen. D'Armiento said the Senate group trusts in its community to understand where a demonstration is supposed to take place, without need of barriers to pen people in. She said any event policy has to have the respect of the community, without the assumption that student demonstrations mean dangerous crowds.

She said that she would make sure in conversations with the administration to stress the need to have the policies carried out respectfully.

She repeated Sen. Wasaya's statement about the need for a mechanism to allow students to request special consideration of unusual location requests.

Sen. Jalaj Mehta (Stu., SEAS/Undergrad) asked whether the event policy or the Rules of Conduct would be used in the actual monitoring of demonstrations.

Sen. D'Armiento welcomed the question because it showed where confusion is likely to occur between the event policy and the Rules of Conduct. The Senate group wanted to make sure that the event policy does not encroach on the jurisdiction of the Rules.

Sen. D'Armiento said that if the event policy forbids a certain location for a demonstration, and a student goes there anyway and also throws a rock through a window, there are two violations—a violation of the event policy, and a violation of the Rules of Conduct.

Sen. Alexander Roman (TC) asked about the protocol for bringing the New York City police on campus.

Sen. D'Armiento said that at a demonstration on January 19 there was some unfortunate activity; since then the NYPD has been coming on campus to investigate. She looked forward to a time when the NYPD are no longer coming during protests, and when the campus can return to a settled state. She said nothing had changed in the Statutory restrictions on bringing police on campus.

Sen. Jeffrey Gordon (Ten., Law) asked what the event policy says about a classroom building or a library as a site for a demonstration.

Sen. D'Armiento said a demonstration in either of these types of location would be violating both the event policy and the Rules of Conduct.

Sen. Henry Ginsberg (Ten., VP&S) asked for a definition of an event. Sen. D'Armiento said it is a public expression by one or more people.

She said this and many other questions would have to be sorted out during the first six months of the new policy. She said the Senate's role would be to protect protesters' speech rights as primary.

Sen. Ginsberg mentioned the problem of finding the boundary of acceptable speech. What if you wish for the disappearance of a certain group, but don't name the group?

Sen. D'Armiento said the fundamental point is that the event policy must not enter into the realm of content. It must make determinations like, You registered your event for the South Lawn, but went to the North Lawn. All issues of content must be addressed through the Rules of Conduct.

She said the Rules of Content do not allow calls for genocide or other hateful acts. The Rules do not need to be modified to prohibit these.

Sen. Ian Beilin (Libraries) followed up on Sen. Bernofsky's comment about limitations on sites for demonstrations. He said this issue has come up for many rallies on the Columbia campus and others. There are commonly gatherings, followed by marches. He recalled Take Back the Night events, which not only take place after permissible protest hours, but also involve a rally followed by a march. These events have always been peaceful.

Sen. D'Armiento said that event could perhaps be considered under the special approval process. This may be one of the bumps in the road during the first six months of the new policy.

Another event might be a vigil, or some other gathering at night to sit somewhere and perhaps do some readings. Sen. D'Armiento said she wanted students to be able to do the things they need to do to express themselves.

Sen. D'Armiento asked senators to raise any remaining issues promptly so they could be addressed in the remaining negotiations.

Sen. Freyer understood that there could be a policy for the University to test for six months or so, and then there would be time to review and modify it.

Sen. D'Armiento urged students not to get into trouble testing the new policy, but to speak up about it. She said it was hard to know what the policy is at the moment. The Senate has not accepted the event policy instituted last October. So there is an acute need for a clearly understood policy. She advised students who are planning events to try to register them as they used to do.

Sen. Bernofsky noted that President Shafik had not attended a plenary since making a brief appearance at the September meeting. Sen. Bernofsky asked if someone could communicate to the president that the Senate really should be able to meet with her.

Sen. D'Armiento agreed, saying she would have pushed to have the president attend the present plenary if it hadn't been for the Barnard president's inauguration.

She said the Executive Committee would be in serious negotiations during the next four days over the event policy, and urged senators to alert her to problems she might be missing. She acknowledged the work of the Executive Committee, which had devoted many hours to this effort, and stressed the dedication of the Senate's student leaders.

New business

Resolution to Approve an Academic Program Leading to the Master of Science in Climate (Climate School) (Education Committee). Education Committee co-chair James Applegate introduced Sen. Shelley Saltzman (TTOT, SPS), who led the review subcommittee for the degree proposal. On hand from the Climate School to answer questions were Interim Dean Jeffrey Shaman; Sen. Ruth DeFries, University Professor and a founding dean of the Climate School, and Jim Glover, Senior Associate Dean.

Sen. Saltzman described the proposed [M.S. in Climate](#) in some detail (Binder, 12-38).

At the end of Sen. Saltzman's report, Sen. D'Armiento invited questions.

Sen. Madiyar Nurakhmetov (Stu., SIPA) asked for clarification of the differences between the M.S. in Climate and the following existing programs: the Climate School's own M.A. in Climate and Society, the two SPS M.S. programs in Sustainability Science and Sustainability Management, and SIPA's M.P.A. in Environmental Science and Policy, in which Sen. Nurakhmetov was enrolled. He noted that many of the program features that Sen. Saltzman had described as unique to the M.S. in Climate were available in his own program.

Prof. Jeffrey Shaman, the Climate's School's interim dean, said many of the features Sen. Nurakhmetov had mentioned—capstones, specializations, internships—are common to most legitimate academic programs. What is unique about the M.S. in Climate is its focus on climate, paired with other components, including the kinds of expertise identified in the other programs Sen. Nurakhmetov had mentioned, and in the three advanced certificates available as part of the M.S. in Climate program. Prof. Shaman anticipated other joint ventures (in Climate Finance with the Business School, in Energy Transitions with SEAS, in the built environment with the Architecture School, and so on).

Sen. Margaret Corn asked what would happen to the Climate School's M.A. in Climate and Society program if the M.S. in Climate were to fulfill its promise as the school's flagship program.

Dean Shaman said there would be a clear choice for students considering the two programs, and each may have enough appeal to remain viable options. The one-year M.A. program would appeal to one group both in its primary focus on social issues and its greater affordability. The two-year, more STEM-focused program M.S. program would give candidates more options for scientific specializations in different areas of climate studies.

Sen. Alexander Roman (TC) asked what the timeline would be for enrollment in the program and what the program would look like in final form. Dean Shaman said the aim was to launch the M.S. in Climate in the fall of 2025.

Sen. Ruth DeFries, a founding dean of the Climate School, thanked the subcommittee and Sen. Saltzman for conducting a thorough, rigorous review of the M.S. in Climate.

Vote. There being no further discussion, Sen. D'Armiento called for a vote. The Senate approved the program by a vote of 66-0 with no abstentions.

Resolution Reconfirming Our Commitment to the Principles of Academic Freedom and Shared Governance (Faculty Affairs, Academic Freedom, and Tenure Committee, and Student Affairs Committee). Two members of Faculty Affairs, Prof. Joseph Howley (Ten., A&S/Hum) and Sen. James Applegate, presented the resolution.

Prof. Howley mentioned a couple of current conditions that have prompted the Faculty Affairs Committee to draft the present [resolution](#) (Binder, 39-40). One is acute pressure on institutional leadership to take action against controversial speech and events that have riled campuses, including Columbia's, in recent months.

Another relevant condition in the last few years, Prof. Howley said, has been clear political encroachment on higher education. He said friends and colleagues in state school systems, particularly in Florida and North Carolina, have seen the most aggressive form of this. And the last month or so has shown what it's like when that attention is directed at Ivy League institutions.

Prof. Howley reviewed some of the main documents and ideas that figured in the resolution's eight Whereas clauses, including the frameworks of rights and of responsibilities that constitute academic freedom; a set of key statements, including the Chicago Principles (2014) and the Kalven Report (1967); a set of Columbia documents, including the definition of academic freedom in the University Statutes, the Affirmative Statement in the Senate's 2015 revision of the Rules of University Conduct, and a few Senate resolutions. These Whereas clauses support seven principles and standards, which Prof. Howley also summarized. They are the autonomy of faculty review and promotion procedures, freedom of speech and expression as laid out in the Affirmative Statement (Section 440 of the University Statutes), restraint by university leaders in taking political positions, active review of the university's investments, a commitment to shared governance, reliance on the university's own faculty expertise in policymaking, and reliance on the University Senate as an institutional defender of academic freedom.

Sen. Howley also mentioned several recent efforts by colleagues that helped to shape the resolution. One was the establishment over the semester break of the Columbia Academic Freedom Council, which is not an official institutional body, but has a number of Columbia faculty on it. Sen. Applegate had co-written the CAFC's Statement of Responsibilities. Another is the Columbia chapter of the American

Association of University Professors, which had weighed in on academic freedom issues in recent months. And during the previous fall the Barnard faculty had completed a major discussion and referendum on academic freedom.

Sen. Applegate commented on the context of the resolution. He said he had been involved in these issues in the Senate for over a decade. They had also been much in the news lately, and he has been asked by reporters at the New York Times and the Wall Street Journal what academic freedom is.

Of the many possible answers to this question, he preferred to focus on the need for a tolerant, respectful culture that is needed to make academic freedom work. That includes a responsibility to be careful about how he expresses his ideas, the obligation to be a respectful listener, and the ability to respectfully disagree, and to understand that someone who attacks his ideas is not attacking him as a person.

Under conditions like these, academic freedom can play the crucial role it needs to in an educational institution.

Sen. D'Armiento noted that the resolution had strong support from President Shafik.

Sen. Cheng Gong (SEAS/Grad), vice chair of the Student Affairs Committee, expressed student support for the resolution. He said students are the among the primary beneficiaries of a faculty that is free to explore and teach ideas without restraint. Education is not just about absorbing information, but also challenging assumptions, contributing to knowledge creation, and promoting the mutual respect that is essential in academic work.

Sen. D'Armiento addressed a question in the chat from Sen. Savannah Thais (Research Officers), who asked what happens when a faculty member makes a genuine threat of harassment. She said threats and other misconduct should be reported. She also noted that the Executive Committee has reported threats of harassment to administrators. A non-senator provided a URL in the chat for reporting complaints: <https://universitylife.columbia.edu/report>; another provided the name of the reporting mechanism: Maxient.

A question in the chat from Sen. Bernofsky asked whether department chairs count as institutional leadership, capable of speaking for the institution. Sen. D'Armiento responded that they do count that way.

At Sen. D'Armiento's request, Prof. Howley addressed a question from Sen. Gordon in the chat: "What is a 'political position'? Would condemnation of a Supreme Court case count as political?" Prof. Howley said this question and Sen. Bernofsky's highlight part of the resolution that needs definition. He said Barnard has lately taken a maximalist approach to this question, whereas the principle of restraint would lead to a more minimal position. But for the purposes of the resolution what is counted as political positions is mostly statements.

As for Sen. Gordon's question about condemnation of a Supreme Court decision, Prof. Howley recalled the statement from the Kalven Report that the University is the home of critics but is not itself the critic. What is the effect of leadership simply saying, This is good or bad, without taking action or making policy? This is the sort of thing that the academic freedom resolution is asking to happen as seldom as possible

To Sen. Gordon's other question, about what counts as a "strong institutional interest," Prof. Howley said that that usually means a legal obligation. But one benefit of that of the principle of restraint is that

the University in most cases does not have to take a position because its default stance is that it does not take positions.

Sen. Applegate said one case in which the University has a compelling interest but no legal obligation is race in college admissions. But even in a case like this, it makes sense to assure that Law School classes can debate both sides of the issue.

Sen. D'Armiento interrupted here, to say the Senate needed to move on. But she said the spirit of the resolution was in keeping with Prof. Howley's sense that the University should keep debating important issues continuously, without having to take positions on them. She said this was also President Shafik's sense of the issue.

Vote. The Senate then approved the motion by a vote of 68-0, with two abstentions.

- *Resolution to Endorse the University Policy for Recording Classes.*

Sen. D'Armiento said Senior Vice Provost Soulaymane Kachani was present to describe the proposed [policy](#) (Binder, 40-43). She said this policy had been written by the administration. She hoped the Senate would endorse it.

Education Committee co-chair James Applegate said the proposed policy came from the provost's office and essentially forbids the unauthorized recording of classes. He added to Education Committee members who were present that this measure reached the committee chairs after the last committee meeting on January 19.

Sen. Applegate said this topic had been discussed several times by the Education Committee in the last 10-15 years, going back to the advent of online education and MOOCs, which could record every last word said for the entirety of the class.

Sen. Applegate said his sense was that in general the norm should be not to record classes. A classroom must be an environment in which students are free to try on ideas for size. When this policy came to the Executive Committee, he suggested going to a vote because he didn't think it would be controversial.

Sen. Letty Moss-Salentijn, Sen. Applegate's co-chair, said that when the resolution came, it seemed innocuous enough to vote on. But several members of the Education committee correctly said it had not been discussed there, so she thought it should first be discussed and voted on in Education.

Sen. D'Armiento said the Executive Committee did vote on the resolution, and the Education Committee later also conducted an electronic vote. She said the Senate had asked the administration not to post policies without consulting the Senate. That's why it went straight to the Executive Committee, and was in the Senate for discussion.

She asked Senior Vice Provost Kachani to present the policy, followed by Senate discussion.

Sen. Moss-Salentijn said this was not right.

SVP Kachani said his premise was that learning flourishes through thoughtful discussion that takes place constantly on the Columbia campus. He said the goal of the policy is to promote a spirit of trust and open exchange of ideas in Columbia classrooms.

He said the policy would prohibit unauthorized recording and provide restrictions on the recording of participants in classes. Authorized recordings would still be permitted, and faculty may record their courses after notifying students. But the expectation is that there will be no recording without explicit

permission from the instructor or absent a reasonable accommodation for a disability from Disability Services. And even authorized recordings may not be shared without the consent of those recorded. SVP Kachani said this policy borrows from a recent Yale policy.

He said that at least one senator had raised a question about one-party-consent law in New York State. Sen. Kachani said he had consulted with the General Counsel on this point, and had learned that the proposed policy establishes a higher standard, which is permitted. It would also forbid the recording of a conversation between two parties by someone who is not one of those two parties.

SVP Kachani hoped to start the conversation with the Senate and its committees. He invited questions.

Sen. D'Armiento recognized that this policy came to the Senate quickly, but she said that the present discussion was in response to the Senate's insistence on having a chance to discuss policies before they are adopted.

Sen. Bernofsky asked whether there was some emergency reason why the Senate couldn't wait one month, so that senators get to weigh in? She also wanted to know what students thought of the policy before any Senate vote.

Sen. D'Armiento said the emergency is the present moment in time, when people are getting filmed in class and put onto Tik Tok. Other institutions are addressing this, and it is seen by the administration—perhaps not the Senate—as something that needs to be addressed right away.

Sen. Susan Witte (Ten., SW) said that at the School of Social Work some faculty are currently trying to get a full faculty vote because the SSW has a mandated administrative policy that requires all courses to be recorded across the board. She asked whether she should bring this issue to her school administration.

Sen. D'Armiento recognized that this was a separate path from the Senate's.

Sen. Erick Zent (Stu., CC) recalled an incident from a couple of years earlier in which a law professor said something that was recorded. Sen. Zent said filming can be a good enforcement mechanism, a way of keeping people accountable. Under the policy now under consideration, would a student be penalized for filming someone in that way?

Sen. D'Armiento doubted that a student would be penalized for bringing a recording to the administration. She thought the administration would pay attention to it. She said it was evident to her that the purpose of the policy was to make sure recordings don't end up on Tik Tok.

Sen. D'Armiento took Sen. Zent's point. She said it was important to recognize that policies have to be received with reasonable understanding. It would be right to fight for someone whose intention was not to break the policy. She thought that was a response the Senate would support.

Sen. Corn asked whether the policy could stop someone who was recording in an authorized manner (perhaps a student with a disability accommodation) from later sending out a transcript of the recording.

SVP Kachani said this general issue may need some more time. He said he had felt there was an urgency to get this done, as peer institutions had. Sen. D'Armiento agreed.

Sen. Michael Gerrard said the practice at the Law School is to automatically record all classes unless instructors decide otherwise. Students are told this at the start of the semester.

SVP Kachani said online degree programs follow the same procedure. He said the proposed policy was more concerned with the dissemination of recordings to the public without consent.

Sen. Jeanine D'Armiento said she thought dissemination of a recording was quite different from showing it to the administration.

Sen. Saltzman said she teaches an English language class at the Law School in the summer and has requested that the class not be recorded because it's for international L.L.M students, who have worried that their statements in class could get them in trouble with their governments.

Sen. D'Armiento said the Senate would postpone a vote on the resolution on recording until the next plenary.

- *Committee reports and updates*

Creation of an FLI Student Space (Commission on Diversity, Student Affairs, Campus Planning and Physical Development). Sen. Natalie Voigt (TTOT, Nursing), faculty co-chair of the Diversity Commission, introduced Sen. Maria Martinez (Stu., CC), a co-author of the [report](#) (Binder, 40-68).

Sen. Martinez said this report had been in the works since September, and she was happy to be presenting it. She said the University defines FLI students as those whose parents have not received a four-year bachelor's degree in the United States and can make minimal or no contribution to their student's tuition. Sen. Martinez recognized herself as FLI.

She said Columbia has some excellent resources for FLI students, but they can be hard to find. Sometimes it can be hard to connect with the FLI library, the food pantry, or with UpLIFT, which provides special-interest housing for undergraduates. Students want to make these resources more accessible, in a single space.

Sen. Martinez said that was the goal of the report she was presenting now. A joint subcommittee drawn from the Senate Student Affairs and Campus Planning and Physical Development committees and the Diversity Commission had been established to support this effort. The subcommittee will help to redistribute resources more equitably across Columbia schools.

Sen. Martinez said one of the lessons learned from working with FLI student leaders is that FLI students don't see each other much on campus. A dedicated FLI space would correct that condition. Sen. Martinez said it would also enable FLI students to make use of books, technologies, advisers, calculators, and tutors, and to bring unity to this underrepresented group. She said this effort will not replace what individual schools are doing for their FLI students. The point is to provide more resources for all schools.

Sen. Martinez handed off to Sadia Safa, a Columbia College senior and fellow Diversity Commission member who had been involved in FLI advocacy for the past three years. Ms. Safa said it wasn't until the spring semester of 2022-23, when she attended a national FLI conference at Penn, that she actually got together with other FLI leaders from across the nation and realized how Columbia could potentially do much more to consolidate its resources. She showed a chart that she had put together after that conference showing each institution's FLI resources, including some that she hoped to see Columbia bring to the table. She pointed out an FLI program called Penn First Plus, which includes a center for managing FLI resources and a gathering place for FLI students.

One important event at Columbia was an FLI student town hall, where undergraduates from various Columbia schools spoke about their experiences at Columbia. One of them told about his struggle with food insecurity, and how he was living day to day, can to can, from the food pantry, but not getting enough food. Other students spoke about a lack of transparency and proper communication with some Columbia offices, making it harder for FLI students to get access to needed resources, and taking up time they needed for studying and extra-curricular activities.

Another student said it was troubling and isolating that Columbia does not formally recognize First-Generation College Day on November 8. There was also no social media page highlighting the FLI identity.

Throughout these discussions it became clear to Ms. Safa and other student leaders that the institution did not recognize the intersectionality or the dynamic variations in the FLI experience. She said recognition and belonging are the key issues. Students need the resources not only to survive at Columbia, but to thrive and have better lives. She said the next step toward that goal is to establish an FLI center, humanizing the campus experience of FLI students.

Sen. Rosalba Savage, Diversity Commission student co-chair, spoke next. She shared a phrase that she said is common in first-generation Latino homes: “Ni de aqui, ni de alla” (Neither from here nor from there). She said this phrase captures the experience of first-generation students.

She said the transition for many can be complex and daunting, as FLI students try to navigate within a system that is historically constructed to oppress them. An FLI scholar at Columbia is likely an outlier, and seeking help may not be something they’re comfortable with.

FLI students are outsiders within academia, and then outsiders again when they return home, where they are sometimes seen as privileged. In her situation she is often called upon for help because she is viewed as someone with power provided by her education.

FLI students ask to be allowed to embrace their shared uniqueness and empower themselves so they can capitalize on those things that make them who they are. A place where they can share their experiences is an investment not only for them and for Columbia, but for future FLI students. A bridge is needed to get from here to there. Current FLI students are that bridge. They look forward to saying “De aqui y de alla,” from here *and* there.

Sen Voigt added one clarification: the Diversity Commission was not seeking a vote on the FLI proposal at the present meeting. That would happen at a later plenary.

Sen. DeFries praised the FLI presentation and proposal. She also asked one question: Could international students be classified as FLI?

She said that the parents of international students would likely not have an American bachelor’s degree, but they may or may not be low income. How would that be situation be interpreted?

Sen. Martinez said her group is envisioning that any student who identifies as FLI should be considered. One reason was that financial status can change abruptly, even in the course of a semester. She recognized that problems of that kind might not be recognized through the financial aid system. But she wanted to ensure that an FLI space would be open not only to undergraduates but to students in all 16 Columbia schools. So she was hoping to open this space to anyone who identifies as FLI. She expected to address this issue in the joint subcommittee.

Sen. Gordon asked whether the FLI center would mainly serve Columbia College students and other undergrads rather than professional school students. He said the commonality of concerns across these groups was not clear to him. He also hoped that a final proposal would include some budgetary information, particularly about ongoing staff and other support.

About the commonality of concerns, Sen. Gordon asked whether FLI students would align mainly with already existing affinity groups reflecting their own ethnic identities. He said there seemed to be an implicit assumption that the FLI identity would cut across all groups. He was unsure about that assumption.

Sen. D'Armiento said questions about demographics and budgetary issues could be addressed when the final FLI proposal is presented.

Sen. Alexander Roman (TC) said FLI spaces had played a vital role in his own undergraduate experience at the University of Wisconsin at Madison, where the FLI facility is an entire gym building. He stressed the importance for FLI students of having clear access to important information. His own mother had struggled with this problem as a college student, and his father had had to drop out because he didn't have basic information about the FAFSA process. If he had filed in time, he could have gone to college for free.

Sen. Romero added that affinity groups can play a vital role in disseminating critical information. Having run affinity groups, he understood the importance of the care and attention that they can provide. He said it's very much a cultural thing. But an FLI space, with strong advocacy, can help students connect with the institution.

Sen. Adrian Brugger (Research Officers) thanked the presenters, and wholeheartedly supported their effort, and he was confident that that the Campus Planning and Physical Development Committee, on which he served, did as well.

He also wanted to underline the importance of recognizing that FLI students have special needs and challenges irrespective of origin.

He said he was the second person in his family to go to college, after his father. So he recognized the need, irrespective of ethnic backgrounds, in classes with students, especially during Covid, when he had students who said they couldn't go back to their home state to take their classes, because there was no internet there. How could they take a remote class if they didn't have communication beyond a barely working cell phone? Sen. Brugger said there are things that many at Columbia don't even recognize, such as hunger, right here. If Columbia has funding for something like a cappella singing groups, it can find funding for more fundamental needs. He thought this issue was a no-brainer.

Adjourn. Sen. Jeanine D'Armiento also thanked the presenters, and looked forward to hearing a final FLI proposal at a subsequent plenary. She appreciated the patience of senators who had sat through a long meeting. She adjourned the meeting at about 2:50 pm.

Respectfully submitted,

Tom Mathewson, Senate staff

**INFORMATION AND COMMUNICATIONS TECHNOLOGY POLICY COMMITTEE
ANNUAL REPORT FOR 2022-23**

The IT Committee held seven regular meetings last year, along with its joint annual meeting with the Education committee and another end-of-year meeting with the Education and Student Affairs committees.

Here are the main topics and guests at those meetings:

September 30, 2022. The committee discussed the need for new forms for faculty and students to fill out instead of the current plethora of PDFs. Web Forms are currently replacing these and were discussed in more detail at the November 4 meeting. We also discussed the importance for students of getting access to Adobe Pro, Zoom Pro, and Google Collab Pro . Another issue was a problem on the uptown campus with *duo factor authentication* for certain programs or platforms.

November 4, 2022. There was a short presentation from Sen. Bruce Goumain (Stu., GS) on student problems with the registration process, which University Registrar Barry Kane promised to discuss later in more detail, focusing on a new version of Vergil being created to improve course searches.

EVP for Research Jeannette Wing and her group described a collaborative strategic planning effort to address research computing needs that they were currently working on with the faculty-led Shared Research Computing Policy Advisory Committee (SRCPAC), with the Columbia Medical Center, and the Zuckerman Institute. She also asked to hear from faculty about current problems with research computing, particularly having to do with High Performance Computing (HPC) and the Cloud. CUIT VP Gaspare LoDuca also mentioned the need for training researchers in the more advanced uses of computers to work on their grants.

EVP for Finance and IT Anne Sullivan and her team presented new work on CU Concur for travel and expense management, pointing out how world travel was finally growing after the pandemic. Her team is offering training systems and has published multiple “Quick Guides” for many new staff and faculty who want to use Concur now that the pandemic is over.

December 16, 2022. There was a discussion with Registrar Barry Kane about some students’ SSOL outages during early spring registration in November and the search functionality of the current version of Vergil, which is currently being upgraded. The new version will be available in Spring 2024. The old directory of classes is also being replaced by something better.

Next there was a talk by Prof. Christopher Marianetti, retiring chair of SRCPAC, about faculty involvement in that system. An important addition had been programming “boot camps” to explain

to faculty how to use the system to visualize their data. The expenses of Cloud Computing for faculty and finding Columbia funding to buy into clusters outside Columbia was also discussed. Another topic was the loss of staff at SRCPAC as well as at CUIT and Rascal during the pandemic, and what could be done to address this problem. There was also a follow-up discussion on replacing PDF forms, with Sen. Adam Cannon (TTOT, SEAS) presenting the FormAssembly services to CUIT.

January 27, 2023. The IT Committee met with Chad Neal, Chief Information Officer of CUIMC who provided an update on the three-year Wi-Fi upgrade project at the uptown campus.

Iddo Drori, Adjunct Professor of Computer Science, gave a presentation about a process he has been developing to use ChatGPT to administer and handle basic preparations for a course, including the work of producing and grading homework exercises for students. He noted the usefulness and also some of the limitations of this process

February 17, 2023. Maneesha Aggarwal, AVP for Academic, Emerging Technologies and Research Services, discussed several projects funded by industry partners that the Emerging Technology Consortium members are pursuing, including a technological innovation for use in monitoring blood pressure in pediatric surgery and an effective new way to combat air pollution in an extremely hot urban setting by planting trees and vegetation using Virtual Reality data provided by a surveying drone.

There was also a presentation on technical and pedagogical issues related to Courseworks by Center for Teaching and Learning Executive Director Catherine Ross and her group.

March 24, 2023. Gaspare LoDuca and Barry Kane spoke at some length on their years-long, comprehensive effort to upgrade the Student Information System and revamp the registration process.

May 1, 2023. At the annual joint meeting of the IT and Education committees, five faculty and members and administrators discussed the educational implications of ChatGPT, identifying the system's strengths and weaknesses, including the opportunities it provides for students to cheat on their work. Information on how to combat this problem was also discussed. The presenters were Computer Science professors Zhou Yu, Vishal Misra, and Julia Hirschberg, along with Catherine Ross (CTL) and Victoria Malaney-Brown, Director for Academic Integrity for CC and SEAS.

May 2, 2023. The IT Committee met jointly with the Education and Student Affairs committees to hear a presentation from Senior Vice Provost Soulaymane Kachani on Columbia Online, a new venture encompassing all of Columbia's major online educational initiatives, intended "to ensure the richest and most dynamic educational environment possible for Columbia's students, as well as learners outside the University."

At the end of the year, we said good-bye to my co-chair of the last decade, Prof. Matt Jones, who left Columbia for another university. He brought his steadfast skepticism and wide-ranging perspective as an historian of science to our experience of our technological moment.

We would like to offer again our particular thanks to Gaspare Lo Duca and to Barry Kane, who have always shared their time and energy unstintingly with our committee. Our meetings were as stimulating last year as ever!

Respectfully submitted,

Julia Hirschberg, Chair, IT Committee

INFORMATION AND COMMUNICATIONS TECHNOLOGY COMMITTEE 2022-23

Members and Contributors

Ten.	Julia Hirschberg	Co-Chair	SEAS
Ten.	Matthew L. Jones	Co-Chair	A&S/SS
Ten.	Itsik Pe'er		SEAS
TTOT	Adam Cannon		SEAS
Stu.	Camilo Garcia		SPS
Stu.	Bruce Goumain		GS
Libraries	Teresa Harris		Libraries
Admin. Staff	Joel Rosenblatt		Admin. Staff
Research Officers	Nancy J. LoIacono		Professional Research Officers
Admin.	Maneesha Aggarwal		Admin..
Admin.	Gaspare S. LoDuca		Admin.
Alum.	Stephen Negron		Alum.
Admin.	Ellen Binder		Admin. Staff.
Admin. Staff	Barry Kane		Admin. Staff
Ten.	Henry Spotnitz		P&S
Admin.	Sandesh Tuladhar		Admin..
Admin. Staff	Janie Weiss		Admin. Staff: CUIMC

IT Committee Report from 2022-23

Julia Hirschberg, Chair
Computer Science Dept.

- *September 30, 2022.* The **committee discussed the need for new forms for faculty and students to fill out instead of the current plethora of PDFs. Web Forms are currently replacing these** and were discussed in more detail at the November 4 meeting. We also discussed the importance for students of getting access to **Adobe Pro, Zoom Pro and Google Colab Pro**
- *November 4, 2022.*
 - There was a short presentation from Sen. Bruce Goumain (Stu., GS) on student **problems with the registration process**, which University Registrar Barry Kane promised to discuss later in more detail, focusing on a new version of Vergil being created to improve course searches.
 - **EVP for Research Jeannette Wing and her group described a collaborative strategic planning effort to address research computing needs** they're working on with the faculty-led Shared Research Computing Policy Advisory Committee (SRCPAC), with the Columbia Medical Center, and the Zuckerman Institute.

- She also asked to hear from faculty about current problems with research computing, particularly having to do with High Performance Computing (HPC) and the Cloud. CUIT VP Gaspare LoDuca also mentioned the need for training researchers in the more advanced uses of computers to work on their grants.
- EVP for Finance and IT Anne Sullivan and her team presented new work on CU Concur for travel and expense management, pointing out how world travel was finally growing after the pandemic. Her team is offering training systems and has published multiple “Quick Guides” for many new staff and faculty who want to use Concur now that the pandemic is over.
- *December 16, 2022.*
 - There was a discussion with Registrar Barry Kane about some students’ SSOL outages during early spring registration in November and the search functionality of the current version of Vergil, which is currently being upgraded. The new version will be available in Spring 2024. The old directory of classes is also being replaced by something better.

- Next there was a talk by **Prof. Christopher Marianetti, retiring chair of SRCPAC, about faculty involvement in that system of HPC clusters. An important addition had been programming “boot camps” to explain to faculty how to use the system to visualize their data.** The expenses of Cloud Computing for faculty and finding Columbia funding to buy into clusters outside Columbia was also discussed. Another topic was the loss of staff at SRCPAC as well as at CUIT and Rascal during the pandemic, and what could be done to address this problem. There was also a follow-up discussion on replacing PDF forms, with Sen. Adam Cannon (TTOT, SEAS) presenting the FormAssembly services to CUIT.
- *January 27, 2023.*
 - The IT Committee met with **Chad Neal, Chief Information Officer of CUIMC, who provided an update on the 3-year wifi upgrade project at the uptown campus.**
 - **Iddo Drori, Adjunct Professor of Computer Science, gave a presentation about a process he has been developing to use ChatGPT to administer and handle basic preparations for a course, including the work of producing and grading homework exercises for students.** He noted the usefulness and also some of the limitations of this process

- *February 17, 2023.*
 - **Maneesha Aggarwal, AVP for Academic, Emerging Technologies and Research Services, discussed several projects funded by industry partners that the Emerging Technology Consortium members are pursuing, including a technological innovation for use in monitoring blood pressure in pediatric surgery and an effective new way to combat air pollution in an extremely hot urban setting by planting trees and vegetation using Virtual Reality data provided by a surveying drone.**
 - There was also a **presentation on technical and pedagogical issues related to Courseworks** by Center for Teaching and Learning Executive Director Catherine Ross and her group.
- *March 24, 2023.* **Gaspere LoDuca and Barry Kane spoke at some length on their years-long, comprehensive effort to upgrade the Student Information System and revamp the registration process.**
- *May 1, 2023.* At the **annual joint meeting of the IT and Education committees, faculty, senate members and administrators discussed the educational implications of ChatGPT**, identifying the system's strengths and weaknesses, including the opportunities it provides for students to cheat on their work.

End of our 2022-23 Year

- **At the end of the year we said good-bye to my co-chair of the last decade, Prof. Matt Jones, who left Columbia for another university. He brought his steadfast skepticism and wide-ranging perspective as an historian of science to our experience of our technological moment.**
- **We would like to offer again our particular thanks to Gaspare Lo Duca, Maneesha Agarwal and Barry Kane, who have always shared their time and energy unstintingly with our committee. Our meetings were as stimulating last year as ever!**

University Senate

Proposed: February 23, 2024

Adopted: February 23, 2024

61-0-1: in favor-opposed-abstained

**RESOLUTION TO APPROVE THE ESTABLISHMENT OF THE
ROY AND DIANA VAGELOS INSTITUTE FOR BIOMEDICAL RESEARCH EDUCATION**

WHEREAS a pressing need has emerged to strengthen the enterprise of graduate student and early-career research in the biomedical sciences, which has languished in recent decades in the United States; and

WHEREAS this problem has been evident at the Vagelos College of Physicians and Surgeons in the lack of a consistent and sufficient source of funding to support graduate students who want to pursue research; and

WHEREAS a gift of \$175 million from Roy and Diana Vagelos has enabled the Medical School to launch a major effort to revitalize graduate student research, and

WHEREAS this gift will include an endowment of \$125 million for Ph.D. students, which will be especially important in the first two years of their programs; and

WHEREAS the remaining \$50 million will support medical students, residents, fellows and young physicians seeking to pursue full careers as physician-scientists, and

WHEREAS a Director of Graduate Training, Professor Hashim al-Hashimi, has been appointed for the proposed Institute, which will be governed by a steering committee led by Katrina Armstrong, Executive Vice President for Health and Biomedical Sciences and Dean of the Faculties of Health Sciences and the Vagelos College of Physicians and Surgeons;

WHEREAS internal and external committees of distinguished scientists have provided advice and guidance during the gestation of the Institute, and

WHEREAS the fundamental goal of all of these efforts is to enable scientific advancement, through discoveries both modest and, from time to time, stunning and transformative, and

WHEREAS the University Senate Education Committee has reviewed and endorsed plans for the proposed Institute;

THEREFORE BE IT RESOLVED that the University Senate approve the establishment of the Roy and Diana Vagelos Institute for Biomedical Research Education, and

BE IT FURTHER RESOLVED that the University Senate forward this resolution to the Columbia Board of Trustees for appropriate action.

Proponent: Education Committee

Establishment of the Roy and Diana Vagelos Institute for Biomedical Research Education

- 1. *Brief description and rationale:* Provide the unit name, mission, objectives, and expected impact on the University from its activities. Describe how it will transcend school and department lines, and how it could enhance Columbia's strengths and expand its research horizons.**

Currently in the United States, PhD students, MDs in training, residents, fellows, and early-career physician-scientists who pursue a career in basic, translational or clinical research must contend with both financial challenges and professional uncertainty¹. NIH funds just one in five applications for initial independent research support made by scientific investigators².

Accounting for inflation, funding from the National Institutes of Health only recently began to emerge from a 20-year period of decline and stagnation³. Early-career biomedical scientists are navigating their way through a shrunken support system that suffers from too few resources and too much career instability. They are often pressured in ways subtle and not so subtle to build on accepted knowledge, instead of pursuing what is disruptive, fascinating, and ultimately capable of driving science forward. Inadequate pay and poor benefits disproportionately discourage aspiring scientists of color and those from low-income households. The number of physicians engaged in research has dwindled to a third of what it was in the 1980s. Not surprisingly, recent evidence suggests that our greatest breakthroughs are fewer and further between⁴, at the very moment when public health challenges are multiplying and becoming more urgent.

To address these pressing concerns for the future of biomedical research, the Vagelos College of Physicians and Surgeons seeks to establish the Roy and Diana Vagelos Institute for Biomedical Research Education (VIBRE), funded by Roy and Diana Vagelos' recent \$175 million gift to Columbia University (Appendix A). The Vagelos Institute for Biomedical Research Education (VIBRE) created with this gift will be home to PhD students pursuing the most creative, potentially disruptive ideas in biomedical science, and will spur the training of more physician-scientists able to translate the latest paradigm-shifting discoveries into revolutionary new methods in patient care.

By directly addressing and mitigating these obstacles, the VIBRE seeks to create an academic research environment conducive to bold experimentation and a sustained commitment to solving longstanding medical problems. Reducing the disproportionate financial burdens that deter historically marginalized groups from pursuing a career in science is a central pillar of this program.

¹ The number of physician-scientists has dwindled over recent decades due largely to the challenges for medical trainees and early-career MDs interested in research careers. A 2017 NEJM article, "[Saving the Endangered Physician-Scientist—A Plan for Accelerating Medical Breakthroughs](#)(link is external and opens in a new window)," cites finances and funding as the top issues contributing to the decline in number of physicians.

² Success Rates: R01-Equivalent and Research Project Grants: <https://report.nih.gov/nihdatabook/category/10>

³ National Institutes of Health (NIH) Funding: FY1996-FY2023: <https://sgp.fas.org/crs/misc/R43341.pdf>

⁴ Papers and patents are becoming less disruptive over time: <https://www.nature.com/articles/s41586-022-05543-x>

2. Leadership: Describe the process by which Director is appointed, duration of appointment, and the individual to whom the Director will report.

Anchored at the Vagelos College of Physicians and Surgeons, the Institute will be led initially and on an interim basis by Katrina Armstrong, MD, MSCE, as Dean of VP&S and EVP for Health and Biomedical Sciences. Effective January 1, 2024, the Director of Graduate Training in the VIBRE is distinguished faculty member, Hashim M. Al-Hashimi, PhD, Roy and Diana Vagelos Professor of Biochemistry and Molecular Biophysics, who will also transition to the position of Associate Dean for Biomedical Graduate Education effective July 1, 2024. His CV is attached (Appendix B). He will be responsible for developing a new academic model for biomedical PhD education at VP&S.

As initial steps in the development of the VIBRE, Dean Armstrong appointed and charged a “Graduate Education Future State Task Force” consisting of outstanding Columbia University scientific faculty. She also invited an External Scientific Advisory Board (ESAB) to provide expertise from leaders in the field of graduate biomedical education. The CU task force included:

- Hashim Al Hashimi, PhD, Roy and Diana Vagelos Professor of Biochemistry and Molecular Biophysics; <https://www.biochem.cuimc.columbia.edu/research/research-labs/al-hashimi-lab>
- Dmitriy Aronov, PhD, Assistant Professor of Neuroscience at the Zuckerman Institute; <https://www.aronovlab.com/>
- Henry Colecraft, PhD, John C. Dalton Professor of Physiology and Cellular Biophysics and Professor of Molecular Pharmacology and Therapeutics; <https://www.pharmacology.cuimc.columbia.edu/research/colecraft-lab>
- Laura Johnston, PhD, Professor of Genetics and Development; <https://www.genetics.cuimc.columbia.edu/research-labs/johnston-lab>
- Emily Mace, PhD, Associate Professor of Pediatric Immunology (in Pediatrics); <https://www.macelab.nyc/>
- Kenneth Olive, PhD, Associate Professor of Medicine; <https://www.olivelab.org/>
- Samuel Sternberg, PhD, Assistant Professor of Biochemistry and Molecular Biophysics; <https://www.sternberglab.org/>
- Chunhua Weng, PhD, Professor of Biomedical Informatics; <https://people.dbmi.columbia.edu/~chw7007/>
- Danielle Matsushima, PhD, Director of Research and Strategic Initiatives in the VP&S Office for Research, Alumna of the Genetics and Development PhD Program, and task force facilitator

The Executive Summary of the task force proceedings, “Reimagining the VP&S Biomedical PhD Graduate Programs,” is attached (Appendix C), as is a PowerPoint summary presented to the VP&S Faculty Council (Appendix D).

The ESAB is listed below and has met to comment and react to the Graduate Education Future State Task Force, and they will convene yearly.

- Enrique M. De La Cruz, PhD, William R. Kenan Professor of Molecular Biophysics and Biochemistry at the Yale School of Medicine; <https://delacruzlab.yale.edu/>
- Tracy Johnson, PhD, Keith and Cecilia Terasaki Presidential Endowed Chair in the Life Sciences, Professor of Molecular, Cell, and Developmental Biology, and Dean of Life Sciences at UCLA; <https://www.uclahealth.org/cancer/members/tracy-johnson>
- William Kaelin Jr., MD, Professor of Medicine at the Dana-Farber Cancer Institute; <https://kaelinlab.dana-farber.org/>
- Shirley M. Tilghman, PhD, President Emerita and Professor of Molecular Biology and Public Affairs at Princeton University; <https://molbio.princeton.edu/people/shirley-m-tilghman>
- Additional expertise will be added as programs are designed.

As outlined in the gift agreement for the Vageloses' commitment, VIBRE will be governed by a Steering Committee which Dr. Armstrong will chair. The Steering Committee will be selected by Dean Armstrong in consultation with the Associate Dean for Biomedical Graduate Medical Education, the Vice Dean for Research and other outstanding Columbia University scientific faculty. The initial term for Steering Committee members shall be 3 years. The committee will oversee and establish guidelines for the programs to be developed as part of the Institute's activities. The committee will work with the ESAB to optimize expertise in biomedical education as new PhD and Physician Scientist Pathways programs are developed. VP&S faculty members who participate in the training of students, residents, or fellows as part of the programs made possible by the gift shall be considered members of the institute.

3. *Host:* Indicate the University unit(s) (school or schools) that will host the unit, as appropriate.

The Vagelos Institute will reside in the Columbia University Vagelos College of Physicians and Surgeons.

4. *Letter of support:* A letter of support from the leaders of the units hosting the unit (e.g., Dean or Executive Vice President) must be included.

(Appendix E)

5. *Size:* Provide the anticipated number of faculty; number of post-doctoral fellows/scientists/scholars or student members (if any); and any staffing needs.

Any VP&S faculty member who participates in the research training of students, residents, or fellows as part of the programs made possible by the gift shall be considered members of the Institute. Student, trainees, or post-doctoral fellows/scientists/scholars participating in the programs established by the gift shall also be considered student members. Staffing will be provided initially by an administrative coordinator and with support from the VP&S Office of the Associate Vice Dean for Graduate Affairs. Additional faculty members will be supported by the Dean's office to develop key scientific and educational roles during the implementation phase of revised graduate education training.

6. *Membership:* Give a summary of how faculty, post-docs, and students (as appropriate) can apply and be selected for membership and their duration of appointment.

Membership in the Institute shall include any faculty member who participates in the research training of students, residents, or fellows as part of the programs established by the commitment from Roy and Diana Vagelos. Application procedures for students, residents, fellows, or other trainees shall be established by the VP&S Dean, the Associate Dean for Graduate Education, in conjunction with the Steering Committee, with input from the External Scientific Advisory Board.

7. *Space:* Describe the space required, and the proposed physical location of the unit.

The Center will be housed at the Vagelos College of Physicians and Surgeons and will exist virtually on the Columbia University Irving Medical Center campus. The laboratories and existing departmental and school-based facilities used for training of students and trainees in biomedical research will be leveraged in support of the Institute's training mission. VIBRE will coordinate curriculum, set, and measure standards for best practices in training the scientific workforce. Traditional departments and disciplines will continue to provide specific scientific laboratory and didactic experiences.

8. *Goals:* Provide a list and brief description of the major goals for scholarship and educational programming, including community outreach and clinical services, as appropriate, during the unit's first five years.

The Institute and the funding provided by Roy and Diana Vagelos will enable Columbia to create a new academic model that encourages and accelerates the intellectual risk-taking needed to make historic advances in health science research. The Institute will develop programs, curriculum tracks, and meaningful research training opportunities that create supportive career pathways, promising stability and academic freedom, to attract more students and junior faculty to the essential endeavor of biomedical research. The funding for this program importantly will provide significant support to students and trainees, thus increasing opportunities to those from a broad range of backgrounds where financial pressures of continued education would be a barrier to seeking advanced scientific training.

In accordance with the terms of the Vagelos gift, the general plan will be as follows:

- \$125 million of the funds shall be in the form of an endowment to insure the long-term survival of the VIBRE and will be used to support tuition, stipends, fees, living expenses of PhD and MD/PhD students during their PhD training. VP&S will thereby be able to support the costs of 1st and 2nd year PhD students, as well as expand the class size of PhD students. This support will encourage students of diverse backgrounds to pursue such training without financial stress.
- \$50 million will be used to support the development of Physician Scientists. Physician Scientists who move easily between bench and bedside play an irreplaceable role in biomedical research. The numbers of physician-scientists have decreased significantly and must be replenished using new funding and training models. VIBRE presents

Columbia University's VP&S with an unparalleled opportunity to lead in replenishing the critical mass of physician-scientists. Funding will support medical student research awards for students to undertake mentored research projects. This funding mechanism will also support research training of residents and fellows. An additional portion of the funding will provide salary and research support to early career physician faculty who often struggle to balance the pressures of income generating clinical work and time/effort spent developing research careers.

- A recent presentation for the VP&S Faculty Council is included for details on the process leading to recommendations for VIBRE. (Appendix D)

9. *Budget:* Provide a budget for the first five years, clearly indicating funding already acquired versus funding still needed. List all grant resources, philanthropic resources, or associated gifts.

Funding for the programs to be developed by the Institute will be supported by the Vagelos commitment of \$175 million. \$125 million will fund an endowment that transforms the model for supporting PhD students, allowing for the transformation of the curriculum and engagement of a more diverse pool of candidates. \$50 million will be used to fund programs to support aspiring physician-scientists seeking to develop expertise in both fundamental biology and clinical medicine, including research programs for medical students, resident trainees and fellows conducting graduate medical education, and early-career physician-scientists just transitioning to faculty positions.

See attached outline of proposed long-term funding structures for programs to be developed by the Vagelos Institute. (Appendix F)

Appendix A: Gift Agreement for the Roy and Diana Vagelos \$175 million gift to Columbia University.

Appendix B: Dr. Hashim Al-Hashimi's CV.

Appendix C: "Reimagining the VP&S Biomedical PhD Graduate Programs," the Executive Summary of task force proceedings.

Appendix D: Faculty Council presentation by Dr. Hashim Al-Hashimi.

Appendix E: Letter of support.

Appendix F: Proposed Funding Model.

APPENDIX B:

Dr. Hashim Al-Hashimi's CV

Hashim M. Al-Hashimi

Roy and Diana Vagelos Professor of Biochemistry & Molecular Biophysics
Columbia University Irving Medical Center
New York, NY 10032
Email: ha2639@cumc.columbia.edu

Education

- Ph.D. in Biophysical Chemistry Yale University December 2000
- B.S. in Chemistry Imperial College London UK May 1995
- International Baccalaureate UWC Atlantic College Wales UK May 1992

Positions

5/22-present	Roy and Diana Vagelos Professor of Biochemistry & Molecular Biophysics, Columbia University
5/18-4/22	Vice Chair, Department of Biochemistry, Duke University
5/15-4/22	James B. Duke Professor of Biochemistry and Chemistry, Duke University
9/14-4/22	Director Duke Center for RNA Biology, Duke University
1/14-4/15	Professor of Biochemistry and Chemistry, Duke University
9/12-12/13	J Lawrence Oncley Collegiate Professor University of Michigan
9/12-9/13	Acting Director of Biophysics, University of Michigan
9/10-9/13	Associate Director of Biophysics, University of Michigan
9/09-8/12	Robert L Kuczkowski Professor, University of Michigan
1/10-current	Co-Founder and Chair of Scientific Advisory Board, Nymirum Inc
9/09-8/09	Robert L Kuczkowski Associate Professor, University of Michigan
9/08-8/09	Associate Professor of Chemistry & Biophysics, University of Michigan
9/02-8/08	Assistant Professor of Chemistry & Biophysics, University of Michigan
5/02-8/02	Senior Research Scientist, Memorial Sloan-Kettering Institute (advisor Dinshaw J Patel)
5/01-4/02	Research Associate Memorial Sloan-Kettering Institute (advisor Dinshaw J Patel)
5/00-4/01	Research Fellow Memorial Sloan-Kettering Institute (advisor Dinshaw J Patel)

Honors & Awards

2021	Fellow of the Biophysical Society
2020	Fellow of the International Society of Magnetic Resonance
2020	NAS Award in Molecular Biology National Academy of Science
2015	James B. Duke Distinguished Professorship
2014	Akutsu Award of the Korean NMR Society
2013	Agilent Technologies Thought Leader Award
2013	Vilcek Prize for Creative Promise in Biomedical Science
2012	Founder's Medal International Conference on Magnetic Resonance in Biological Systems
2012	Collegiate Professorship University of Michigan
2011	Popular Science Magazine 'Brilliant 10' scientists and engineers in USA
2009	LSA Excellence in Teaching Award University of Michigan
2009	Robert L Kuczkowski Faculty Career Enhancement Award
2006	National Science Foundation Career Award
2004	Ralph E Powe Junior Faculty Enhancement Award

Named Lectureships, Plenary, & Keynote Talks

- 2022 Keynote 5th Annual RNA-targeted Drug Discovery Boston MA December 13-15
2022 Gitte Vold lecture October 27th UCSD
2022 Keynote 2022 Canadian Chemistry Conference and Exhibition June 13 to 17, 2022.
2021 Keynote 4th RNA Targeted Drug Discovery Summit December 8
2021 Keynote Rustbelt RNA Meeting Columbus September 10
2021 Sarkar lecture Hospital for Sick Children Toronto Canada May 31
2020 Atlantic Circle – InConversation June 26
2019 Keynote NCI RNA Biology Initiative Retreat November 4
2019 Plenary Lecture 4th Instruct Biennial Structural Biology Conference Alcalá de Henares Spain May 23
2018 Plenary 7th CMBI Meeting of the Center of Molecular Biosciences Innsbruck Vill Austria September 19
2018 Keynote Annual Symposium of the Molecular Biophysics Graduate Program NYU May 25th
2018 Plenary iNEXT Annual User Meeting Grenoble France March 19-21 2018 (declined)
2017 Keynote Gateway NMR conference OSU Columbus November 4
2017 Plenary 16th NMR Users Meeting Angra dos Reis Rio de Janeiro Brazil May 8-12 (declined)
2016 Keynote 72nd ACS Southwest Regional Meeting The Galveston Island Convention Center Galveston Texas November 10-13 2016 (declined)
2016 Keynote Société Française de Biophysique/ Groupe Thématique Biologie de l'Association Française de Cristallographie Obernai Alsace France December 13-16
2016 Keynote Regional Biophysics Conference Hamline University October 15
2016 Plenary RNA: structure meets function Stockholm Sweden June 12-15
2016 Seminar series of luminary scientists Masaryk University Brno Czech Republic March 24
2015 Plenary Frontiers of Science: Research and Education in the Middle East Malta VII Conference Rabat Morocco November 15-20
2014 KAIST Chemistry Lectureship Korean NMR Society Gyeongju South Korea July 15-17
2014 Korean NMR Society Akutsu Award Lecture Gyeongju South Korea July 14
2014 Plenary European Magnetic Resonance conference EUROMAR Zurich June 29-July 3
2013 Plenary 5th Asia-Pacific NMR Symposium Brisbane Australia Oct 27-31
2013 Distinguished Scientist Lecture Seminar - National Cancer Institute at Frederick Sept 25-26
2013 Keynote Computational Aspects of Biomolecular NMR Gordon Research Conference June 2-7
2013 Plenary 18th ISMAR Meeting Rio de Janeiro Brazil May 21
2013 Future of Biophysics Burroughs Welcome Fund Symposium Biophysical Society 57th Meeting
2012 Plenary ICMRBS Lyon France August 19-24
2011 Science at the Edge Seminar MSU February
2010 Keynote Chicago Area NMR Discussion Group UIUC November
2010 Plenary Symposium on RNA in Motion Iowa State University September
2010 Keynote XXIVth ICMRBS Cairns Australia August
2009 Plenary EUROMAR Göteborg Sweden July
2008 Plenary 49th ENC Conference Asilomar CA March

Service & Professional Activities

- Associate Editor Magnetic Resonance (November 2019-current)
Editorial Board *Structure* (February 2015-current)
Member NIH Study Section Macromolecular Structure and Function D (2019-current)
ISMAR Fellows Committee (2022-current)
Member Duke University Executive Oversight Committee (2019-2023)
Member Duke University MEDx Steering Committee (2017-2023)
Co-Founder and Chair of Scientific Advisory Board Base4 Inc (Durham, NC)
Editorial Board *Journal of Biological Chemistry* (July 2012-2017)

Member NCI Board of Scientific Counselors for Basic Sciences (2015-2020)
Member Duke Academic Council (2019-2020)
Member Duke University Provost APT committee (2016-2019)
Member Advisory Board for BioMagResBank (2010-2015)
Chair *Symposium on RNA Biology XI: RNA Tool and Target* October 16 – 17 2015
Chair *RNA Biology 2019 Annual Meeting of the American Society of Biochemistry & Molecular Biology*
April 6-10 2019 Orlando FL
Ad hoc member NIH Study section MSF-C (2006 2007 and 2012); MSF-D (2012 2015 and 2017)
AIDSRRRC (2012) and MSF-A (2014 and 2015).
Member organizing committee for workshops on “RNA Dynamics” Telluride CO July 2009 and “RNA
Electrostatics” Telluride CO July 2017

Publications

- 170 Turing, von Neumann, and the computational architecture of biological machines. Al-Hashimi HM. **PNAS** 2023 120(25):e2220022120. doi: 10.1073/pnas.2220022120. Epub 2023 Jun 12.
- 169 RNA conformational propensities determine cellular activity. Ken ML, Roy R, Geng A, Ganser LR, Manghrani A, Cullen BR, Schulze-Gahmen U, Herschlag D, Al-Hashimi HM. **Nature**. 2023 617(7962):835-841. doi: 10.1038/s41586-023-06080-x. Epub 2023 May 17. PMID: 37198487
- 168 Dynamic basis for dA•dGTP and dA•d8OGTP misincorporation via Hoogsteen base pairs. Gu S, Szymanski ES, Rangadurai AK, Shi H, Liu B, Manghrani A, Al-Hashimi HM. **Nat Chem Biol**. 2023 19(7):900-910. doi: 10.1038/s41589-023-01306-5. Epub 2023 Apr 24.
- 167 RBM45 is an m6A-binding protein that affects neuronal differentiation and the splicing of a subset of mRNAs Choi SH, Flamand MN, Liu B, Zhu H, Hu M, Wang M, Sewell J, Holley CL, Al-Hashimi HM, and Meyer KD **Cell Reports** 40(9):111293 2022
- 166 Probing Watson-Crick and Hoogsteen base pairing in duplex DNA using dynamic nuclear polarization solid-state NMR spectroscopy. Conroy DW, Xu Y, Shi H, Gonzalez Salguero N, Purusottam RN, Shannon MD, Al-Hashimi HM*, Jaroniec CP* **PNAS** 119(30) 2022
- 165 Measuring thermodynamic preferences to form non-native conformations in nucleic acids using ultraviolet melting. Rangadurai A, Shi H, Xu Y, Liu B, Abou Assi H, Boom JD, Zhou H, Kimsey IJ, Al-Hashimi HM. **PNAS** Jun 14;119(24) 2022
- 164 Structural basis for impaired 5' processing of a mutant tRNA associated with defects in neuronal homeostasis. Lai LB, Lai SM, Szymanski ES, Kapur M, Choi EK, Al-Hashimi HM, Ackerman SL, Gopalan V. **PNAS** Mar 8;119(10) 2022
- 163 Rapid assessment of Watson-Crick to Hoogsteen exchange in unlabeled DNA duplexes using high power SELOPE imino 1H CEST Liu B, Rangadurai A, Shi H, Al-Hashimi HM **Magn Reson** 2 (2), 715-731 2021
- 162 Revealing Hoogsteen base pairs in crystal structures of protein-DNA complexes Shi H, Kimsey IJ, Liu H, Pham U, Schumacher MA*, and Al-Hashimi HM* **Nucleic Acid Res** 49(21):12540-12555 2021
- 161 A quantitative model predicts how m⁶A reshapes the kinetic landscape of nucleic acid hybridization and conformational transitions Liu B, Shi H, Rangadurai A, Nussbaumer F, Chu C-C, Erharter KA, Case DA, Kreutz C, and Al-Hashimi HM **Nat Comm** 12(1):5201 2021

- 160 Liu B, Shi H, Al-Hashimi HM **Current Opin Struct Biol** 70:16-25 2021
- 159 Kelly M, Chu C-C, Shi H, Ganser LR, Bogerd HP, Huynh K, Hou Y, Cullen BR, Al-Hashimi HM Understanding the characteristics of nonspecific binding of drug-like compounds to canonical stem-loop RNAs and their implications for functional cellular assays **RNA** 27(1):12-26 2021
- 158 DNA mismatches reveal widespread conformational penalties in protein-DNA recognition Afek A, Shi H, Rangadurai A, Sahay H, Senitzki A, Xhani S, Fang M, Salinas R, Mielko Z, Pufall MA, Poon GMK, Haran TE, Schumacher MA, Al-Hashimi HM*, Gordan R* **Nature** 587(7833):291-296 2020
- 157 2'-O-methylation can increase the abundance and lifetime of alternative RNA conformational states Abou Assi A, Rangadurai A, Shi H, Liu B, Clay M, Erharter KA, Kreutz C, Holley C, Al-Hashimi HM **Nucleic Acid Res** 48(21):12365–12379 2020
- 156 Rapid and accurate determination of atomistic RNA dynamic ensemble models using NMR and structure prediction Shi H, Rangadurai A, Abou Assi A, Roy R, Case DA, Herschlag D, Joseph DY, Al-Hashimi HM **Nat Comm** 11:5531 2020
- 155 Hoogsteen base pairs increase the susceptibility of double-stranded DNA to cytotoxic damage Xu Y*, Manghrani A*, Liu B, Shi H, Pham U, Liu A, Al-Hashimi HM **J Biol Chem** 295(47):15933–15947 2020 *Co-First Authors
- 154 Probing conformational transitions towards mutagenic Watson-Crick-like G•T mismatches using off-resonance sugar carbon R1 ρ relaxation dispersion Rangadurai A, Szymanski ES, Kimsey I, Shi H, Al-Hashimi HM **J Biomol NMR** 74(8-9):457-471 2020
- 153 Environmental Effects on Guanine-Thymine Mispair Tautomerization Explored with Quantum Mechanical/Molecular Mechanical Free Energy Simulations Li P, Rangadurai A, Al-Hashimi HM, Hammes-Schiffer S **J Am Chem Soc** 142(25):11183–11191 2020
- 152 Anomalous reverse transcription through chemical modifications in polyadenosine stretches Kladwang W, Topkar V, Liu B, Rangan R, Hodges T, Keane S, Al-Hashimi HM, Das R **Biochemistry** 59(23):2154–2170 2020
- 151 Extending the Sensitivity of CEST to Micro-to-Millisecond Dynamics in Nucleic Acids Using High Power Radio-Frequency Fields Rangadurai A, Shi H, Al-Hashimi HM **Angewandte Chemie International Edition** 59(28):11262-11266 2020
- 150 m⁶A minimally impacts the structure, dynamics, and Rev ARM binding properties of HIV-1 RRE stem IIB Chu C, Liu B, Kreutz C, and Al-Hashimi HM* **PLOS ONE** 14(12):e0224850 2019
- 149 Demonstration that small molecules can bind and stabilize low-abundance short-lived RNA excited conformational states Ganser LR, Patwardhan NN, Hargrove AE, and Al-Hashimi HM* **JMB** 432(4):1297-1304 2020
- 148 Exposing Hidden High-Affinity RNA Conformational States Orlovskya NI, Al-Hashimi HM* and Oas TG* **J Am Chem Soc** 142(2):907-921 2020
- 147 NMR chemical exchange reveals that N⁶-methyladenosine slows RNA annealing Shi H, Liu B, Nussbaumer F, Rangadurai A, Kreutz C*, and Al-Hashimi HM* **J Am Chem Soc** 141(51):19988-19993 2019
- 146 Probing RNA conformational equilibria in the functional cellular context Ganser LR*, Chu C*, Bogerd HP, Kelly ML, Cullen BR, and Al-Hashimi HM **Cell Rep** 30(8):2472-2480 2020 *Co-First Authors

- 145 Ganser LR, Kelly M, Herschlag D, and Al-Hashimi HM The roles of structural dynamics in the cellular functions of RNAs **Nat Rev Mol Cell Biol** 20(8):474-489 2019
- 144 Direct evidence for (G)O6···H₂-N4(C)⁺ hydrogen bonding in transient G(*syn*)-C⁺ and G(*syn*)-m⁵C⁺ Hoogsteen base pairs in duplex DNA from cytosine amino nitrogen off-resonance R_{1ρ} relaxation dispersion measurements Rangadurai A, Kremser J, Shi H, Kreutz C, and Al-Hashimi HM **JMR** 308:106589 2019
- 143 Infrared spectroscopic observation of a G-C⁺ Hoogsteen base pair in the DNA:TATA box binding protein complex under solution conditions Stelling AL, Liu AY, Zeng W, Schumacher MA, and Al-Hashimi HM **Angewandte Chemie** 58(35):12010-12013 2019
- 142 Characterizing microsecond-to-millisecond chemical exchange in nucleic acids using on- and off-resonance R_{1ρ} Rangadurai R, Szymanski ES, Kimsey IJ, Shi H, and Al-Hashimi HM **Progress in Nuclear Magnetic Resonance Spectroscopy** 112-113:55-102 2019
- 141 Dynamic ensemble of HIV-1 RRE stem IIB reveals non-native conformations that disrupt the Rev binding site Chu C, Kreutz C, and Al-Hashimi HM **Nucleic Acid Res** 247(13):7105-7117 2019
- 140 Characterizing Watson-Crick versus Hoogsteen base-pairing in a DNA-protein complex using NMR and site-specifically ¹³C/¹⁵N labeled DNA Zhou H, Sathyamoorthy B, Stelling A, Xue Y, Zhang Y, Case DA, Rice PA, and Al-Hashimi HM **Biochemistry** 58(15):1963-1974 2019
- 139 The RRM of the kRNA-editing proteinTbRGG2 uses multiple surfaces to bind and remodel RNA Travis B, Shaw PLR, Liu B, Ravindra K, Ilff H, Al-Hashimi HM and Schumacher MA **Nucleic Acid Res** 47(4):2130-2142 2019
- 138 Structural and Functional Characterization of Sulfonium Carbon-Oxygen Hydrogen Bonding in the Deoxyamino Sugar Methyltransferase TylM1 Fick RJ, Horowitz S, McDole B, Clay MC, Thoden JB, Mehl RA, Holden HM, Al-Hashimi HM, Scheiner S, and Trievel RC **Biochemistry** 58(16):2152-2159 2019
- 137 Kimsey IJ, Szymanski ES, Zahurancik WJ, Shakya A, Xue Y, Chu C, Sathyamoorthy B, Suo Z, Al-Hashimi HM Dynamic Basis for dG•dT misincorporation via tautomerization and ionization **Nature** 554(7691):195-201 2018
- 136 The 5-oxyacetic acid modification destabilizes double helical stem structures and forms anionic Watson-Crick U•G base pairs Strebitzer E, Plangger R, Rangadurai R, Kremser J, Andreas Juen M, Tollinger M, Al-Hashimi HM*, and Kreutz C* **Chem Eur J** 24(71):18903-18906 2018
- 135 Rangadurai A, Zhou H, Merriman D, Meiser N, Liu B, Shi H, Szymanski E, and Al-Hashimi HM Why are Hoogsteen base pairs energetically disfavored in A-RNA compared to B-DNA? **Nucleic Acids Res** 46(20):11099-11114 2018
- 134 Fick R, Clay M, Vander Lee L, Scheiner S, Al-Hashimi HM, Raymond T Water-Mediated Carbon-Oxygen Hydrogen Bonding Facilitates AdoMet Recognition in the Reactivation Domain of Methionine Synthase **Biochemistry** 57(26):3733-3740 2018
- 133 Xu Y, McSally J, Andricioaei I, and Al-Hashimi HM Modulation of Hoogsteen Dynamics on DNA Recognition **Nat Communications** 9(1):1473 2018
- 132 Ganser LR, Lee J, Sathyamoorthy B, Kansal A, Merriman DK, Kelly, M, and Al-Hashimi HM High Performance Virtual Screening by Targeting a High-resolution RNA Dynamic Ensemble **Nat Struct Mol Biol** 25(5):425-434 2018

- 131 Liu B, Merriman DK, Choi SH, Schumacher MA, Plangger R, Kreutz C, Horner SM, Meyer KD, and Al-Hashimi HM A potentially abundant junctional RNA motif stabilized by m⁶A and Mg²⁺ **Nat Communications** 9(1):2761 2018
- 130 Merriman DK, Yuan J, Mustoe AM, Shi H, Herschlag D, Al-Hashimi HM, Similar stacking energetics across varying length RNA bulges despite significant differences in unstacked ensembles **RNA** 24(10):1363-1376 2018
- 129 Shi H, Clay MC, Rangadurai A, Sathyamoorthy B, Case DA, and Al-Hashimi HM Atomic Structures of Excited State A-T Hoogsteen Base Pairs in Duplex DNA by Combining NMR Relaxation Dispersion, Mutagenesis, and Chemical Shift Calculations **JBNMR** 70(4):229-244 2018
- 128 Gracia B, Al-Hashimi HM, Bisaria N, Das R, Herschlag D, and Russell R, Hidden Structural Modules in a Cooperative RNA Folding Transition **Cell Reports** 22(12):3240-3250 2018
- 127 Salmon L, Stull F, Sayle S, Cato C, Akgul S, Foit L, Ahlstrom LS, Eisenmesser EZ, Al-Hashimi HM, Bardwell J, and Horowitz S The Mechanism of HdeA Unfolding and Chaperone Activation **JMB** 430(1):33-40 2018
- 126 Clay MC, Ganser LR, Merriman DK, and Al-Hashimi HM Resolving slow sugar repuckering dynamics in RNA **Nucleic Acid Res** 45(14):e134 2017
- 125 Stelling AL, Xu Y, Zhou H, Choi SH, Clay MC, Merriman DK, and Al-Hashimi HM Robust IR Based Detection of Stable and Fractionally Populated G-C+ and A-T Hoogsteen Base Pairs in Duplex DNA **FEBS Letters** 591(12):1770-1784 2017
- 124 Szymanski ES, Kimsey IJ, Al-Hashimi HM Direct NMR Evidence that Transient Tautomeric and Anionic States in dGdT Form Watson-Crick-like Base Pairs **J Am Chem Soc** 139(12):4326-4329 2017
- 123 Bharathwaj S, Shi H, Zhou H, Yi X, Rangadurai A, Merriman D, and Al-Hashimi HM Insights into Watson-Crick/Hoogsteen Breathing Dynamics and Damage Repair from the Solution Structure and Dynamic Ensemble of DNA Duplexes containing m¹A **Nucleic Acids Res** 2017 45(9):5586-5601 2017
- 122 Vaidyanathan PP, AlSadhan I, Merriman DK, Al-Hashimi HM, Herschlag D Pseudouridine and N-6 methyladenosine modifications weaken PUF protein/RNA interactions **RNA** 23(5):611-618 2017
- 121 Ganser LR and Al-Hashimi HM The HIV-1 Leader RNA Dimeric Interface Revealed by NMR **PNAS** 113(47):13263-13265 2016
- 120 Shakya A, Dougherty C, Yi X, Al-Hashimi HM, and Banaszak Holl M Three RNA Microenvironments Detected in Fluxional Gene Delivery Polyplex Nano-assemblies **ACS Macro Letters** 5 (10) 1104-1108 2016
- 119 Patwardhan N, Ganser L, Kapral G, Eubanks C, Lee J, Sathyamoorthy B, Al-Hashimi HM, Hargrove A, Amiloride as a new RNA-binding scaffold with activity against HIV-1 TAR **Med Chem Comm** 8, 1022-1036 2017
- 118 Gracia B, Xue Y, Bisaria N, Herschlag D, Al-Hashimi HM, Russell R, RNA Structural Modules Control the Rate and Pathway of RNA Folding and Assembly **JMB** 428(20):3972-3985 2016
- 117 Zhou J, Kimsey IJ, Nikolova EN, Sathyamoorthy B, Grazioli G, McSally J, Bai T, Wunderlich CH, Kreutz C, Andricioaei I* and Al-Hashimi HM* m(1)A and m(1)G disrupt A-RNA structure through the intrinsic instability of Hoogsteen base pairs. **Nat Struct Mol Biol** 23(9):803-10 2016

- 116 Merriman D, Yi X, Shan Y, K, Shakya A, Mary C, Al-Hashimi HM* Shortening the HIV-1 TAR RNA Bulge by a Single Nucleotide Preserves Motional Modes Over a Broad Range of Timescales. **Biochemistry** 55(32) 4445-4456 2016
- 115 Xue Y, Gracia B, Herschlag D, Russell R, and Al-Hashimi HM Visualizing Formation of an RNA Folding Intermediate through a Fast Highly Modular Secondary Structure Switch **Nat Communications** 2016;7:ncomms11768. PMID: PMC4909931.
- 114 Shakya A, Dougherty C, Yi X, Al-Hashimi HM, and Banaszak Holl M Rapid Exchange Between Free and Bound States in RNA-Dendrimer Polyplexes: Implications on the Mechanism of Delivery and Release **Biomacromolecules** 7(1):154-64 2016
- 113 Mustoe AM, Al-Hashimi HM, and Brooks III CL Secondary structure encodes a cooperative tertiary folding funnel in the Azoarcus ribozyme **Nucleic Acids Res** 44(1):402-12 2015
- 112 Ren A, Xue Y, Peselis A, Serganov A, Al-Hashimi HM* and Patel DJ* Structural and Dynamic Basis for Low Affinity-High Selectivity Binding of L-glutamine by the Gln-riboswitch **Cell Reports** 13(9):1800-13 2015
- 111 Salmon L, Giambaşu G, Nikolova EN, Petzold K, Bhattacharya A, Case D, Al-Hashimi HM Modulating RNA Alignment Using Directional Dynamic Kinks: Application in Determining an Atomic-Resolution Ensemble for a Hairpin using NMR Residual Dipolar Couplings **J Am Chem Soc** 137(40):12954-65 2015
- 110 Andrałojć W, Ravera E, Salmon L, Parigi G, Al-Hashimi HM, and Luchinat C Inter-helical conformational preferences of HIV-1 TAR-RNA from Maximum Occurrence Analysis of NMR data and molecular dynamics simulations **Phys Chem Chem Phys** 18(8):5743-52 2016
- 109 Yang S and Al-Hashimi HM Unveiling Inherent Degeneracies in Determining Population-weighted Ensembles of Inter-domain Orientational Distributions Using NMR Residual Dipolar Couplings: Application to RNA Helix Junction Helix Motifs **J Phys Chem B** 119(30):9614-26 2015
- 108 Frank A, Zhang Q, Al-Hashimi HM, and Andricioaei I Slowdown of Interhelical Motions Induces a Glass Transition in RNA **Biophys J** 108(12):2876-85 2015
- 107 Xue Y, Kellogg D, Kimsey IJ, Sathyamoorthy B, Stein ZW, McBairty M, and Al-Hashimi HM Characterizing RNA Excited States using NMR Relaxation Dispersion **Methods Enzymol** 558:39-73 2015
- 106 Swanson MD, Boudreaux DM, Salmon L, Chugh J, Winter HC, Meagher JL, André S, Murphy PV, Oscarson S, Roy R, King S, Kaplan MH, Goldstein IJ, Tarbet EB, Hurst BL, Smee DF, de la Fuente C, Hoffmann H, Xue Y, Rice DM, Schols D, Garcia JV, Stuckey JA, Gabius H, Al-Hashimi HM*, and Markovitz DM* Molecular Engineering of a Therapeutic Lectin: Uncoupling Mitogenicity from Antiviral Activity **Cell** 163(3):746-58 2015
- 105 Mustoe AM, Liu X, Lin P, Al-Hashimi HM, Fierke CA, and Brooks III CL Pathogenic insertion mutation destabilizes human mitochondrial tRNASer(UCN) by disrupting its topological constraints **J Am Chem Soc** 137(10):3592-9 2015
- 104 Kimsey I, Petzold K, Sathyamoorthy B, Stein Z, and Al-Hashimi HM Visualizing Transient Watson-Crick Like Mispairs in DNA and RNA Duplexes **Nature** 519(7543):315-20 2015
- 103 Zhou H, Hintze B, Kimsey IJ, Sathyamoorthy B, Yang S, Richardson JS, and Al-Hashimi HM News Insights into Hoogsteen Base-Pairs in Nucleic Acid Duplexes from a Structure-based Survey **Nucleic Acid Res** 43(7):3420-33 2015
- 102 Mouzakis KD, Dethoff DA, Tonelli M, Al-Hashimi, H. and Butcher SE HIV-1 frameshift site

dynamics reveal general RNA junction behavior *Biophys J* 108(3):644-54 2015

- 101 Sathyamoorthy B, Lee J, Kimsey I, and Al-Hashimi HM Development and Application of Aromatic [¹³C, ¹H] SOFAST-HMQC NMR Experiment for Nucleic Acids *J. Biomol NMR* 60(2-3):77-83 2014
- 100 Nikolova E N, Stull F, Al-Hashimi HM Guanine to Inosine Substitution Leads to Large Increases in the Population of a Transient G•C Hoogsteen Base Pair *Biochemistry* 53(46):7145-7 2014
- 99 Mustoe A, Al-Hashimi HM, Brooks CRL Topological Constraints Specify tRNA 3D Structure and Provide Basis for Tertiary Folding Cooperativity *Nucleic Acid Res* 42(18):11792-804 2015
- 98 Lee J, Dethoff EA, Al-Hashimi HM Invisible state dynamically couples distant motifs *PNAS* 111(26):9485-90 2014
- 97 Alvey HS, Gottardo FL, Nikolova EN, Al-Hashimi HM Widespread Transient Hoogsteen Base-Pairs in Canonical Duplex DNA with Variable Energetics *Nat Communications* 5:4786 2014
- 96 Horowitz S, Adhikari U, Dirk LM, Del Rizzo PA, Mehl RA, Houtz RL, Al-Hashimi HM Scheiner S, and Trievel RC Manipulating Unconventional CH-based Hydrogen Bonding in a Methyltransferase via Unnatural Amino Acid Mutagenesis *ACS Chem Biol* 9(8):1692-7 2014
- 95 Zeng X Chugh J, Casiano-Negrone A, Al-Hashimi HM, and Brooks III CL Flipping of the ribosomal A-site adenines provides a basis for tRNA selection *JMB* 426(19):3201-13 2014
- 94 Mustoe A, Brooks CRL, Al-Hashimi HM Hierarchy of RNA Functional Dynamics *Ann Rev Biochem* 83:441-66 2014
- 93 Kimsey, I and Al-Hashimi HM Increasing occurrences and functional roles for high-energy purine-pyrimidine base-pairs in nucleic acids, *Curr Opin in Struct Biol* 24:72-80 2014
- 92 Yang S, Salmon L, and Al-Hashimi HM Measuring the Similarity Between Dynamic Ensembles of Biomolecules. *Nat Methods* 11(5):552-4 2014
- 91 Salmon L, Yang S, and Al-Hashimi HM Advances in the determination of nucleic acid conformational ensembles *Ann Rev Phys Chem* 65:293-316 2014
- 90 Eichhorn CD, Al-Hashimi HM Structural Dynamics of a Single-Stranded RNA-Helix Junction using NMR. *RNA* 20(6):782-91 2014
- 89 Bothe JR, Stein Z, and Al-Hashimi HM Evaluating the Uncertainty in Exchange Parameters Determined from Off-Resonance R₁ρ Relaxation Dispersion for Systems in Fast Exchange. *JMR* 244C:18-29 2014
- 88 Ganser LR, Mustoe AM, and Al-Hashimi HM An RNA Tertiary Switch By Modifying How Helices are Tethered *Genome Biol* 15:425 2014
- 87 Luchinat C, Parigi G, Fragai M, Ravera E, Salmon L, Al-Hashimi HM Insights into Domain-Domain Motions in Proteins and RNA from Solution NMR *Acc Chem Res* 47(10):3118-26 2014
- 86 Mustoe A, Al-Hashimi HM, Brooks CRL Coarse Grained Models Reveal Essential Contributions of Topological Constraints to RNA Conformational Free Energy *J Phys Chem* 118(10):2615-27 2014
- 85 Lee J, Vogt C, McBairty M, and Al-Hashimi, HM Influence of Dimethylsulfoxide on RNA Structure and Ligand Binding *Anal Chem* 85(20):9692-8 2013
- 84 Al-Hashimi HM NMR Studies of Nucleic Acid Dynamics *J Magn Reson* 237:191-204 2013

- 83 Horowitz S Dirk LMA Yesselman JD Nimtz JS Del Rizzo PA Mehl RA Houtz L Al-Hashimi HM and Trievel RC Methyl CH \cdots O Hydrogen Bonds Orchestrate AdoMet-Dependent Methylation **J Am Chem Soc** 135(41):15536-48 2013
- 82 Nikolova E Zhou H Gottardo F Alvey HS Kimsey IJ Al-Hashimi HM Invited Review A Historical Account of Hoogsteen Base-Pairs in Duplex DNA **Biopolymers** 99(12):955-68 2013
- 81 Suddala K, Rinaldi, A, Feng J, Mustoe A, Eichhorn C, Liberman J, Wedekind J, Al-Hashimi, HM, Brooks III CRL, Walter N Single transcriptional and translational preQ1 riboswitches adopt similar pre-folded ensembles that follow distinct folding pathways into the same ligand-bound structure **Nucleic Acid Res** 41(22):10462-75 2013
- 80 Nikolova E Goh G Brooks C Al-Hashimi HM Characterizing the Protonation State of Cytosine in Transient G•C Hoogsteen Base Pairs in Duplex DNA **J Am Chem Soc** 135(18):6766-9 2013
- 79 Salmon L Gavin B Andricioaei I Al-Hashimi HM A General Method for Constructing Atomic-Resolution RNA Ensembles using NMR Residual Dipolar Couplings: The Basis for Inter-helical Motions Revealed **J Am Chem Soc** 135(14):5457-66 2013
- 78 Frank AT Horowitz S Andricioaei I Al-Hashimi HM Utility of (1)H NMR Chemical Shifts in Determining RNA Structure and Dynamics **J Phys Chem B** 117(7):2045-52 2013
- 77 Dethoff L Petzold K Chugh J Casiano-Negroni A and Al-Hashimi HM Visualizing Transient Low-Populated Structures of RNA **Nature** 491(7426):724-8 2012 (Featured in C&CE News Recommended to F1000Prime)
- 76 Nikolova E Bascom G Andricioaei I Al-Hashimi HM Probing Sequence-specific DNA Flexibility in A-tracts and Pyrimidine-purine Steps by NMR 13C Relaxation and MD Simulations **Biochemistry** 51(43):8654-64 2012
- 75 Eichhorn CD Yang S and Al-Hashimi HM Characterizing RNA Dynamics using NMR Residual Dipolar Couplings Book Chapter in Recent Developments in Biomolecular NMR Royal Society of Chemistry Publishing Cambridge 2012
- 74 Dethoff E Chugh J Mustoe AM and Al-Hashimi HM RNA Dynamics: Regulatory Mechanism and Source of Functional Complexity **Nature** 482(7385):322-330 2012
- 73 Bothe J Lowenhaupt K and Al-Hashimi HM Incorporation of CC Steps into Z-DNA: Interplay Between B/Z Junction and Z-DNA Helical Formation **Biochemistry** 51(34):6871-9 2012
- 72 Prevette L Nikolova E Al-Hashimi HM and Banaszak Holl M Intrinsic Dynamics of DNA-Polymer Complexes: A Mechanism for DNA Release **Mol Pharm** 9(9):2743-9 2012
- 71 Nikolova EN Gottardo FL and Al-Hashimi HM Probing Transient Hoogsteen Hydrogen Bonds in Canonical Duplex DNA using NMR Relaxation Dispersion and Single-atom Substitution **J Am Chem Soc** 134(8):3667-70 2012 (Featured in C&EN news)
- 70 Mustoe AM Bailor MH Teixeira R Brooks CL and Al-Hashimi HM New Insights Into the Fundamental Role of Topological Constraints as a Determinant of Two-Way Junction Conformation" **Nucleic Acids Res** 40(2):892-904 2012
- 69 Unraveling the Structural Complexity in a Single Stranded RNA Tail: Implications for Efficient Ligand Binding in the Prequeuosine Riboswitch Eichhorn C Feng J Suddala K Walter NJ Brooks III C Al-Hashimi HM **Nucleic Acids Res** 40(3):1345-55 2012 (Selected as a featured article)
- 68 Stelzer AC Frank AT Kratz JD Swanson M Gonzalez-Hernandez MJ Andricioaei I Markovitz DM Al-Hashimi HM Discovery of HIV-1 Inhibitors by Targeting an RNA Dynamic Ensemble **Nat Chem Biol** 7(8):553-9 2011 (Featured in C&CE News)

- 67 Nikolova E Kim E Wise A O'Brien P Andricioaei I and Al-Hashimi HM Transient Hoogsteen Base-pairs in Canonical Duplex DNA **Nature** 470(7335):498-502 2011 (Highlighted in **Nature** 470(7335):472-32011)
- 66 Petzold K Al-Hashimi HM RNA Structure: Adding a Second Dimension **Nat Chemistry** 3(12):913-5 2011
- 65 Bailor MH Mustoe AM Brooks CL Al-Hashimi HM Topological Constraints: From RNA Secondary Structure to 3D Conformation Folding Pathways and Dynamic Adaptation **Curr Opin Struct Bio** 21(3):296-305 2011
- 64 Bothe J Nikolova E Eichhorn CD Chugh J Hansen AL and Al-Hashimi HM Solution-state NMR Methods for Characterizing the RNA Dynamic Structure Landscape at Atomic Resolution NMR **Nat Methods** 8(11):919-31 2011
- 63 Bailor M H Mustoe AM Brooks CL Al-Hashimi HM 3D Maps of RNA Inter-helical Junctions **Nat Protoc** 6(10):1536-45 2011 (Featured on the cover)
- 62 Bothe J Lowenhaupt K and Al-Hashimi HM Sequence-Specific B-DNA Flexibility Modulates Z-DNA Formation **J Am Chem Soc** 133(7):2016-8 2011
- 61 Horowitz H Yesselman JD Al-Hashimi HM and Trievel RC Direct evidence for methyl group coordination by CH---O hydrogen bonds in SET domain methyltransferases **J Biol Chem** 286(21):18658-63 2011
- 60 Suzuki Y Buer BC Al-Hashimi HM and Marsh EN Using Fluorine NMR to Probe Changes in Structure and Dynamics of Membrane-Active Peptides Interacting with Lipid Bilayers **Biochemistry** 50(27):5979-87 2011
- 59 Nikolova EN and Al-Hashimi HM Thermodynamics of RNA Melting One Base Pair at a Time **RNA** 16(9):1687-91 2010
- 58 Dethoff EA and Al-Hashimi HM A rare example of lock-and-key RNA recognition **J Mol Biol** 404(4):553-4 2010
- 57 Al-Hashimi HM Exciting Structures **Science** 329(5997):1295-6 2010
- 56 Buer BC Chugh J Al-Hashimi HM and Marsh EN Using fluorine NMR to probe the interaction of membrane-active peptides with the lipid bilayer **Biochemistry** 49(27):5760-5 2010
- 55 Stelzer AC Kratz JD Zhang Q and Al-Hashimi HM RNA Dynamics by Design: Biasing Ensemble Towards Ligand Bound State **Angew Chem Int Ed** 49(33):5731-3 2010 (Featured on the cover)
- 54 Bailor M Sun X and Al-Hashimi HM Topology Links RNA Secondary Structure with Global Conformation Dynamics and Adaptation **Science** 327(5962):202-6 2010
- 53 Koutmou KS Casiano-Negrone A Getz MM Pazicni S Penner-Hahn JE Al-Hashimi HM and Fierke C A NMR and XAS reveal an inner-sphere metal binding site in the P4 helix of the metallo-ribozyme ribonuclease P **PNAS** 107(6):2479-84 2010
- 52 Musselman C Zhang Q Al-Hashimi HM Andricioaei I A referencing strategy for the direct comparison of NMR and MD motional parameters in RNA **J Phys Chem B** 114(2):929-39 2010
- 51 Dethoff EA Hansen AL Zhang Q and Al-Hashimi HM Variable Helix Elongation as a Tool to Modulate RNA Alignment and Motional Couplings **J Magn Reson** 202(1):117-21 2009

- 50 Benjamin B de la Salud-Bea R Al-Hashimi HM and Marsh EN Engineering protein stability and specificity using fluorous amino acids: the importance of packing effects **Biochemistry** 48(45):10810-7 2009
- 49 Stelzer A Frank A T Bailor M Al-Hashimi HM and Andricioaei I Constructing Atomic-Resolution RNA Structural Ensembles Using MD and Motionally Decoupled NMR RDCs **Methods** 49(2):167-73 2009
- 48 Zhang Q and Al-Hashimi HM Domain-elongation NMR Spectroscopy Yields New Insights into RNA Dynamics and Adaptive Recognition **RNA** 15(11):1941-8 2009
- 47 Stelzer AC Frazee RW Van Huis C Cleary J Glick GD and Al-Hashimi HM NMR Studies of an Immunomodulatory Benzodiazepine Binding to its Molecular Target on the Mitochondrial F1F0-ATPase **Biopolymers** 93(1):85-92 2009
- 46 Nikolova EN Casiano-Negrone A and Al-Hashimi HM Preparation Resonance Assignment and Preliminary Dynamics Characterization of Residue Specific ¹³C/¹⁵N-labeled Elongated DNA for the Study of Sequence-directed Dynamics by NMR **J Biomol NMR** 45(1-2):9-16 2009
- 45 Buhlage SL Bates CA Rowe SP Minter AR Brennan BB Majmudar CY, Wemmer DE Al-Hashimi HM and Mapp AK Amphipathic small molecules mimic the binding mode and function of endogenous transcription factors **ACS Chem Biol** 15;4(5):335-44 2009
- 44 Al-Hashimi HM Arial View of the HIV Genome **Nature** 460 (7256): 696-697 2009
- 43 Fisher C K and Al-Hashimi HM Approximate Reconstruction of Continuous Domain Motional Paths by Multi-alignment Residual Dipolar Couplings **J Phys Chem B** 113(18):6173-6 2009
- 42 Frank AT Stelzer AC Al-Hashimi HM and Andricioaei I RNA Structural Ensembles From Combination of MD and NMR RDCs: New Insights Into Dynamics and Adaptive Recognition **Nucleic Acid Res** 37(11):3670-9 2009
- 41 Hansen AL Nikolova EN Casiano-Negrone A Al-Hashimi HM Characterizing μ -ms Exchange in Labeled and Unlabeled Nucleic Acids by Carbon R_{1 ρ} NMR **J Am Chem Soc** 25;131(11):3818-9 2009
- 40 Fisher CK Zhang Q Stelzer A and Al-Hashimi HM Ultra-high spatial resolution characterization of domain motions by multi-alignment and multi-reference RDC NMR **J Phys Chem B** 112(51):16815-22 2009
- 39 Dethoff EA Hansen A L Musselman C Watt ED Andricioaei I and Al-Hashimi HM Characterizing Complex Dynamics in the TAR Apical Loop and Motional Correlations with the Bulge by NMR MD and Mutagenesis **Biophys J** 95:3906 2008
- 38 Zhang Q and Al-Hashimi HM Extending the NMR Spatial Resolution Limit in RNA by Motional Couplings **Nat Methods** 5(3):243-5 2008
- 37 Al-Hashimi HM and Walter NG RNA Dynamics: It is about time **Curr Opin Struct Bio** 18(3):321-9 2008
- 36 Zhang Q Stelzer AC Fisher CK and Al-Hashimi HM Visualizing Spatially Correlated Dynamics that Directs RNA Conformational Transitions **Nature** 450:1263-7 2007
(Highlighted in *Nature* 450:1171-2 2007)
- 35 Hansen A and Al-Hashimi HM RNA Dynamics by Carbon Relaxation and Domain Elongation **J Am Chem Soc** 129:16072-82 2007

- 34 Musselman C Al-Hashimi HM Andricioaei I iRED Analysis of TAR RNA Reveals Motional Coupling Long-Range Correlations and a Dynamical Hinge ***Biophys J*** 93:411-22 2007
- 33 Casiano-Negrone A Sun X and Al-Hashimi HM Probing Na⁺ Induced Changes in the HIV-1 TAR Conformational Dynamics Using NMR Residual Dipolar Couplings: New Insights into the Role of Counterions and Electrostatic Interactions in Adaptive Recognition ***Biochemistry*** 46:6525-35 2007
- 32 Bailor M Musselman C Hansen A Patel D J and Al-Hashimi HM Determining the Orientation and Dynamics of RNA helices by NMR Residual Dipolar Couplings ***Nat Protoc*** 2:1536-46 2007 (featured on cover)
- 31 Getz M Sun X Casiano-Negrone A Zhang Q and Al-Hashimi HM NMR Studies of RNA Structural Plasticity and Dynamics using Residual Dipolar Couplings ***Biopolymers*** 86:384-402 2007
- 30 Sun X Zhang Q and Al-Hashimi HM Resolving Fast and Slow Motions in the Internal Loop Containing Stem-loop 1 of HIV-1 that Are Modulated by Mg²⁺ Binding: Role in the Kissing-duplex Structural Transition ***Nucleic Acid Res*** 35:1698-713 2007
- 29 Al-Hashimi HM Beyond Static structures of RNA by NMR: Folding re-folding and dynamics at atomic resolution ***Biopolymers*** 86:345-7 2007
- 28 Getz M Andrews A J Fierke CA and Al-Hashimi HM Structural Plasticity and Mg²⁺ Binding Properties of RNase P P4 from Combined Analysis of NMR Residual Dipolar Couplings and Motionally Decoupled Spin Relaxation ***RNA*** 13:251-66 2007
- 27 Musselman C Pitt S W Gulati K Foster L L Andricioaei I and Al-Hashimi HM Impact of Static and Dynamic A-form Heterogeneity on the Determination of RNA Global Structural Dynamics using NMR Residual Dipolar Couplings ***J Biomol NMR*** 36:235-49 2006
- 26 Zhang Q Sun X Watt E W and Al-Hashimi HM Resolving the Motional Modes that Code for RNA Adaptation ***Science*** 311: 653-6 2006 (Highlighted in *Trends Biochem Sci* 31:421-4 2006)
- 25 Hansen A and Al-Hashimi HM Insight into the CSA Tensors of Nucleobase Carbons in RNA Polynucleotides From Solution Measurements of Residual CSA: Towards New Long-Range Orientational Constraints ***J Magn Reson*** 179:299-307 2006
- 24 Lee H Lee K Al-Hashimi HM and Marsh ENG Modulating Protein Structure with Fluorous Amino Acids: Increased Stability and Native-like Structure Conferred on a 4-Helix Bundle Protein by Hexafluoroisoleucine ***J Am Chem Soc*** 128:337-43 2006
- 23 Pitt S Zhang Q Patel DJ and Al-Hashimi HM Electrostatic interactions dictate the ligand-induced arrest of RNA global motions ***Angew Chem Int Ed*** 44: 3412-3415 2005
- 22 Al-Hashimi HM Dynamics-Based Amplification of RNA Function and its Characterization By Using NMR Spectroscopy ***ChemBioChem*** 6:1506-1519 2005 (Featured on cover)
- 21 Pitt S Majumdar A Patel DJ and Al-Hashimi HM Argininamide Binding Arrests Global Motions in HIV-1 TAR RNA: Comparison with Mg²⁺ induced Conformational Stabilization ***J Mol Biol*** 338: 1-17 2004
- 20 Zhang Q Throolin R Pitt SW Serganov A and Al-Hashimi HM Probing motions between equivalent RNA domains using magnetic field induced residual dipolar couplings: Accounting for correlations between motions and alignment ***J Am Chem Soc*** 125: 10530-10531 2003
- 19 Al-Hashimi HM Pitt S Majumdar A Xu W and Patel DJ Mg²⁺ induced changes in the conformation and dynamics of HIV-1 TAR RNA probed using NMR residual dipolar couplings ***J Mol Biol*** 329: 867-873 2003

- 18 Tolman JR and Al-Hashimi HM Probing biomolecule structural dynamics using residual dipolar couplings ***Ann Rep NMR Spect*** 51: 105-166 2003
- 17 Al-Hashimi HM and Gorin A Application of NMR residual dipolar couplings in studies of RNA: Towards high throughput investigations ***Appl Gen Prot*** 2: (1) 3-16 2003
- 16 Heffelfinger GS et al Martino A Gorin A Xu Y Rintoul MD Geist A Al-Hashimi HM Davidson G S Faulon J L Frink L J Haaland D M Hart W E Jakobsson E Lane T Li M Locascio P Olken F Olman V Palenik B Plimpton Timlin J A Xu D Carbon sequestration in synechococcus sp: from molecular machines to hierarchical modeling ***OMICS*** 6:305-30 2002
- 15 Al-Hashimi HM Gorin A Majumdar A Gosser Y and Patel DJ Towards structural genomics of RNA: Rapid NMR resonance assignment and simultaneous RNA tertiary structure determination using residual dipolar couplings ***J Mol Biol*** 318 637-649 2002
- 14 Al-Hashimi HM Gosser Y Gorin A Hu W Majumdar A and Patel DJ Concerted motions in HIV-1 TAR RNA may allow access to bound state conformations: RNA dynamics from NMR residual dipolar couplings ***J Mol Biol*** 315: 95-102 2002 (featured on cover)
- 13 Al-Hashimi HM and Patel DJ Residual dipolar couplings: synergy between NMR and structural genomics ***J Biomol NMR*** 22: 1-8 2002
- 12 Al-Hashimi HM Majumdar A Gorin A Kettani A Skripkin E and Patel DJ Field and phage induced dipolar couplings in a homodimeric DNA duplex: relative orientation of G•(C-A) triad and G-tetrad motifs and direct determination of C2 symmetry axis orientation ***J Am Chem Soc*** 123: 633-640 2001
- 11 Al-Hashimi HM Gorin A Majumdar A and Patel DJ Alignment of the HTLV-I Rex peptide bound to its target RNA aptamer from magnetic field induced residual dipolar couplings and intermolecular hydrogen bonds ***J Am Chem Soc*** 123: 3179-3180 2001
- 10 Al-Hashimi HM Tolman JR Majumdar A Gorin A and Patel DJ Determining stoichiometry in homomultimeric nucleic acid complexes using magnetic field induced residual dipolar couplings ***J Am Chem Soc*** 123: 5806-5807 2001
- 9 Tolman JR Al-Hashimi HM Kay LE and Prestegard JH Structural and Dynamic Analysis of Residual Dipolar Coupling Data for Proteins ***J Am Chem Soc*** 123: 1416-1424 2001
- 8 Tian F Al-Hashimi HM Craighead J L and Prestegard J H Conformational analysis of a flexible oligosaccharide using residual dipolar couplings ***J Am Chem Soc*** 123: 485-492 2001
- 7 Al-Hashimi HM Valafar H Zartler R Terrell M and Prestegard JH Variation of molecular alignment as a means of resolving orientational ambiguities in protein structures from dipolar couplings ***J Mag Reson*** 143: 402-406 2000
- 6 Fowler C A Tian F Al-Hashimi HM and Prestegard J H Rapid determination of protein folds using residual dipolar couplings ***J Mol Biol*** 304: 447-460 2000
- 5 Prestegard JH Al-Hashimi HM and Tolman JR NMR structures of biomolecules using field induced media and residual dipolar couplings ***Q Rev Biophys*** 33 371-424 2000
- 4 Prestegard JH Bolon PJ Al-Hashimi HM Losonczi J and Fischer MWF 1999 Field induced order in biomolecular solutions: A new source of NMR structural data In: ***Proceedings of the Physical Phenomena at High Magnetic Fields-III*** (Z Fisk LWGorkov R Schrieffer eds) pp 419-420 World Scientific Publishing Co Singapore

- 3 Al-Hashimi HM Bolon PJ and Prestegard JH Molecular Symmetry Effects on Experimentally Determined Order Tensors for Exchanging Ligands *J Mag Reson* 142: 153-158 1999
- 2 Bolon PJ Al-Hashimi HM and Prestegard JH Residual dipolar coupling derived orientational constraints on ligand geometry in a 53 kDa protein-ligand complex *J Mol Biol* 293:107-115 1999 [Highlighted in Chemical & Engineering News]
- 1 Prestegard JH Tolman JR Al-Hashimi HM and Andreac M Protein structure and dynamics from field induced residual dipolar couplings in *Modern Techniques in Protein NMR* pp 311-355 Plenum New York 1998

Issued US Patents

1. NMR assisted design of high affinity ligands for structurally uncharacterized proteins 7,146,277
2. High-Throughput Ensemble-Based Docking Against Flexible Biomolecular Targets 8,498,823
3. Hashim M Al-Hashimi Mike Pape Andrew Stelzer Sung-Hun Bae J P Fairbank Device and Methods for Analysis of Biomolecule Structure Dynamics and Activity US Patent 61,733,784 Filed December 5 2012
4. Andrew Corbet Stelzer, Mitchell Alan McBairty, Hashim M. Al-Hashimi, Sung-Hun Bae Small molecule binding pockets in nucleic acids US Patent 15/254,371 Filed September 2016
5. Markovitz DM, Stuckey JA, Boudreaux DM, Meagher JL, Al-Hashimi HM, Salmon L LECTINS AND USES THEREOF US 14/916,945 Filed September 5 2014

Invited Seminars

- 2023 CECAM workshop on "RNA dynamics from experimental and computational approaches", June 26-28 2023, Paris France
- 2023 PSB Symposium: "Dynamics in Structural Biology" July 6-7 2023, EPN campus, Grenoble, France
- 2023 13th NMR a tool for Biology conference, May 15-17, 2023 Institute Pasteur in Paris.
- 2023 Pittcon meeting March 18
- 2023 Physical Chemistry Seminar, MIT February 7
- 2023 Molecular Biology and Biophysics seminar University of Connecticut January 24
- 2023 Big Quantum Bio meetings January 27 2023
- 2022 Structural Biology Program at Memorial Sloan Kettering Fall Structural Biology Seminar Series October 19 2022
- 2022 XXIX ICMRBS Meeting Boston, MA August 21-25 2022
- 2022 Murnau Conference on Structural Biology October 5
- 2022 Big Quantum Bio meetings January 27 2022
- 2022 Case Western Reserve University Pharmacology January 11
- 2021 Pacificchem 2021 December 16
- 2021 Beilstein Enzymology Symposium September 21 Germany
- 2021 22nd International Society of Magnetic Resonance Conference 9th Asian NMR Pacific Symposium August 22
- 2021 Australia/New Zealand Magnetic Resonance community May 18
- 2020 Structural Biology Seminar Series - National Cancer Institute October 8
- 2020 Tri-Institutional Structural Biology Seminar Series Rockefeller University, Memorial Sloan Kettering Cancer Center ,and Weill Cornell Medicine September 29
- 2020 Emerging MR Webinar June 11
- 2020 Yale University, Molecular Biology and Biophysics, May 4
- 2020 NIEHS Genomic Stability and Structural Biology Laboratory, April 23
- 2020 Harvard University, Systems Biology April 17

2020 University of Denver Department of Chemistry and Biochemistry, March 10
2020 University of Colorado Denver Biochemistry and Molecular Genetics March 9
2020 UCLA Chemistry and Biochemistry February 7
2020 UNC Biochemistry and Biophysics February 4
2019 Nature Conference on Functional Dynamics November 6-8 2019 Tempe AZ
2019 University of Zurich Department of Chemistry Switzerland October 22
2019 University of Basel Biozentrum Discovery Seminar Switzerland October 21
2019 Johns Hopkins University Department of Biophysics October 14
2019 UCSD Biochemistry Seminar Series October 3
2019 NCI Center for Cancer Research RNA Initiative Fall workshop November 4
2019 CIPSM Scientific Oktoberfest Munich Germany September 18-22 2019
2019 University of Chicago Chemistry Seminar April 12
2019 11th NMR a tool for Biology conference Institut Pasteur in Paris France January 28-30
2018 Basic Science Day Duke University School of Medicine September 12
2018 Case Western Reserve University Department of Chemistry September 13
2018 "DNA damage bypass" Chemical Toxicology Division 256th ACS National Meeting August 19-23 (declined)
2018 ICMRBS University College Dublin Ireland August 19-24
2018 ICMRBS satellite workshop on Isotope Labelling Techniques Dublin Ireland August 19
2018 NYU-Nature Conference on Chemical Biology August 13-15
2018 Les Houches – TSRC Protein Dynamics Workshop Les Houches France May 27-Jun 1
2018 Telluride Workshop on Nucleic Acid Chemistry July 23-27
2018 Bioorganic Chemistry Gordon Research Conference Andover New Hampshire June 10-15
2018 The 59th Experimental NMR Conference Orlando Florida April 29 - May 4
2018 255th National ACS Meeting "Discovery of Small Molecules Targeting RNA – Where Are We and Where are We Going?" March 18-22
2018 Frontiers in Biological Sciences Tsinghua University Beijing China March 6
2017 Vanderbilt Chemistry Fall Colloquium
2017 ASRC - City College of New York Seminar series in Biochemistry Biophysics & Biodesign September 6
2017 Rutgers University Biochemistry and Molecular Biology Seminar Series
2017 Telluride Workshop on RNA Electrostatics June 25-30
2017 American Chemical Society's Southeast Regional Meeting Charlotte November 7-11
2017 From Structure to Function: Gene and Epigenetic Regulation Memorial Sloan Kettering Cancer Center May 17
2017 20th ISMAR meeting July 23
2017 University of Minnesota Bollum Symposium May 3
2017 Biological Macromolecules: Structure Catalysis and Regulation Symposium at Tsinghua University China April 15-16
2017 Keystone Symposia on Frontiers of NMR in Life Sciences. March 12-17
2017 NMR: A tool for biology Xth Institut Pasteur and the BRUKER society Paris France January 30-February 1
2016 SFB/GTBIO (Société Française de Biophysique/ Groupe Thématique Biologie de l'Association Française de Cristallographie) Obernai Alsace France December 13-16
2016 Caltech Biochemistry Seminar Dec 10
2016 International Conference on Magnetic Resonance in Biological Systems Kyoto International Conference Center Japan August 21
2016 Tutorial Lecture: EUROMAR conference Aarhus Denmark July 3-7
2015 Symposium #181: Biomolecular Structure and Dynamics: Recent Advances in NMR Pacificchem Waikiki Hawaii December 15
2015 NMR Topical group of the North Jersey section of the American Chemical Society October 21

2015 Albany 2015: 19th State University of New York at Albany June 2015
2015 University of Rochester Medical Center Department of Biochemistry and Biophysics April 29
2015 University of Toronto Structural Biology Seminar Series April 9
2014 NIEHS December 1
2014 UCSD November 6 (declined)
2014 North Jersey ACS topical NMR group October 22 (declined)
2014 UCSF BBC Seminar October 9
2014 MSKCC Structural Biology Seminar September 15
2014 ICMRBS XXVIth August 25 - 29
2014 Graduate Student Invited Seminar: Integrated Analysis of Macromolecular Complexes and Hybrid Methods in Genome Biology Munich Germany July
2014 CHIANTI/INSTRUCT Workshop on Magnetic Resonance for Cellular Structural Biology June 1
2014 Novartis Institutes for BioMedical Research Inc May 7
2014 McGill University Chemical Society Lecture Series program April 29
2014 UMBC Department of Chemistry and Biochemistry April 1
2014 Agilent Technologies Annual User Meeting ENC March 22
2014 University of Georgia Minisymposium on Regulatory RNA February 24
2014 Max Planck Institute for Developmental Biology Miko Seminar Series Tübingen Germany March 5 (declined)
2013 Zing Conference on Protein and RNA Structure Prediction Playa Del Carmen Mexico December 1 (declined)
2013 Columbia University Chemistry Department November 15
2013 UCSD Biochemistry Seminar Series October 17
2013 UIC Physics Colloquium October 10
2013 Princeton University Department of Chemistry Sept 26-27
2013 University of Pennsylvania Department of Chemistry July 10
2013 Structural Biology Related to HIV/AIDS Bethesda MD June 20
2013 2nd KIAS Conference on Subcellular Dynamics KIAS Seoul South Korea June 10-12 (declined)
2013 Function and Protein Synthesis - ASBMB Boston MA April 20-24
2013 Frankfurt NMR Symposium Frankfurt Germany March 25
2013 Agilent Technologies CA Feb 25
2013 Featured Lecturer: RRR Workshop Osaka Japan January 31 (declined)
2013 University of Pennsylvania Department of Biochemistry Jan 31
2012 Department of Chemistry Umea University Sweden November 13
2012 UC-Irvine Department of Chemistry Irvine CA October 23
2012 Boston University Biomedical Engineering September 19
2012 International Congress of the Spanish Biophysical Society Barcelona Spain July 3-6
2012 12th Chianti/INSTRUCT Workshop Italy June 17-22
2012 Biopolymers Gordon Research Conference Newport Rhode Island June 3-8
2012 BioNMR and Computational Structural Biology Barcelona Spain March 12-13
2012 Biophysics Gordon Research Conference Session Chair Ventura CA January 8-13
2011 Zing Conference Playa del Carmen Cancun December 2011 (declined)
2011 ACS Midwest-Great Lakes Joint Regional Meeting in St Louis MO October 19-21 2011
2011 Barcelona Biomed Conference on Macromolecular Dynamics Barcelona Spain October 24-26
2011 Harvard University Department of Molecular & Cellular Biology September 22
2011 EUROMAR Frankfurt Germany August 2011
2011 Enzymes Coenzyme and Metabolic Pathways Gordon Research Conference New Hampshire July 2011(declined)
2011 Telluride Workshop on RNA Dynamics July (declined)
2011 Nucleic Acids Gordon Research Conference University of New England Biddeford Maine June

2011 University of Wisconsin-Madison 35th Steenbock Symposium June
2011 Gordon Research Conference on Computational Aspects of Biomolecular NMR II Ciocco Italy
May
2011 Ohio State University Department of Biochemistry April
2011 51st Experimental Nuclear Magnetic Resonance Conference Monterey CA April
2011 Frontiers of NMR Spectroscopy CCNY March 23
2011 Frontiers of NMR in Biology Montana January
2010 UIUC Department of Biochemistry November
2010 Harvard Medical School November
2010 MIT Department of Chemistry October
2010 Yale University Molecular Biology and Biophysics Student Invited Seminar October
2010 UC Berkeley Department of Chemistry October
2010 3rd EuCheMS Chemistry Congress Nürnberg Germany August
2010 Department of Biochemistry University of Vienna Vienna Austria September
2010 NMRS 2010 Lucknow India February
2010 Workshop on "RNA Dynamics" Telluride Science Research Center Telluride CO July
2010 Pennsylvania State University Department of Chemistry April (declined)
2010 University of Wisconsin – Madison Department of Biochemistry April
2010 University of Massachusetts – Medical School March
2009 University of UMEA Department of Medical Biochemistry and Biophysics Sweden September
2009 Annual Danish NMR symposium Copenhagen Denmark May
2009 Johns Hopkins University Department of Chemistry May
2009 University of Maryland Department of Chemistry & Biochemistry April
2009 UCSD Department of Chemistry and Biochemistry March
2009 Biophysical Society Meeting Symposium "RNA in Biology and Disease" Boston MA February
2009 15th NMRS symposium at Hyderabad India (Declined) February 2009
2008 University of Notre Dame Department of Chemistry and Biochemistry December
2008 Northwestern University Department of Biochemistry Molecular Biology and Cell Biology
October
2008 Complex Carbohydrate Research Center University of Georgia October
2008 Indian Institute of Science Bangalore India (Declined) October
2008 Advances in NMR of protein and nucleic acid molecular recognition Murnau Germany October
2008 23rd International Conference on Magnetic Resonance in Biological Systems (ICMRBS XXIII)
August
2008 Computational Aspects–Biomolecular NMR Gordon Research Conference II Ciocco Italy May
2008 "Nucleic Acids Interactions" Masaryk University Czech Republic (Declined) February 2008
2008 2nd Annual User Meeting European Network Research Infrastructures Frankfurt Germany
January
2007 German National Magnetic Resonance Conference Max-Planck-Institute Biophysical
Chemistry Göttingen Germany September
2007 Symposium on RNA-Ligand Interactions Universität Frankfurt am Main Germany September
2007 Student invited seminar: 4th Symposium on Horizons in Molecular Biology Max Planck-
Institute for Biophysical Chemistry Göttingen Germany September
2007 University of Manitoba Department of Chemistry Manitoba Canada July
2007 University of Washington Department of Chemistry Seattle WA May
2007 University of Georgia Department of Biochemistry Athens GA April
2007 National Institute of Health NIDDK Bethesda MD April
2007 Johns Hopkins University Department of Chemistry Baltimore MD April
2007 Columbia University Department of Biochemistry and Molecular Biophysics New York March
2007 Memorial Sloan-Kettering Cancer Center New York NY March
2007 Viral RNA: Structure Function and Targeting at EMBL Heidelberg Germany March

2007 Frontiers of NMR in Molecular Biology Keystone Conference Snowbird UT January
2006 Williams College Department of Chemistry Williamstown MA December
2006 NMR Society of Japan Kyoto Japan November
2006 Wayne State University Department of Chemistry and Biochemistry Detroit MI October
2006 University of Texas Southwestern Medical Center Department of Biochemistry Dallas TX
October
2006 XXII ICMRBS Göttingen Germany August
2006 Perspectives in Protein and Nucleic Acids NMR Utrecht Netherlands June
2006 University of Texas San Antonio Department of Biochemistry San Antonio TX March
2006 Seventh Iglar Symposium on NMR- Spectroscopy Obergurgl Austria February
2005 European Experimental Magnetic Resonance Conference Veldhoven Netherlands July
2005 46th Experimental Nuclear Magnetic Resonance Conference Providence RI April
2004 Institute for Molecular Biotechnology Jena Germany July
2004 Max Planck-Institute for Biophysical Chemistry Göttingen Germany July
2004 Organic Chemistry Division Universität Frankfurt am Main Frankfurt Germany April

APPENDIX C:

“Reimagining the VP&S Biomedical PhD Graduate Programs”

The Executive Summary of Task Force Proceedings

Reimagining the VP&S Biomedical PhD Graduate Programs Executive Summary

Graduate Education Future State Task Force
Charged by Dean Armstrong

Vagelos Institute of Biomedical Research Education

Vagelos College of Physicians and Surgeons

Columbia University

Executive Summary of the report submitted on September 4, 2023

For internal purposes only.

Executive Summary

Through a generous \$175 million gift from Roy and Diana Vagelos to establish the Vagelos Institute for Biomedical Research Education, the Vagelos College of Physicians and Surgeons (VP&S) has the opportunity to rethink how we train, support, and foster the careers of our graduate students today and in the decades to come.

To identify the necessary steps to create a new academic training model, Dean Armstrong convened a task force in June 2023. The task force met a total of 18 times over three months and held numerous discussions with current students, faculty mentors, program directors, chairs, as well as colleagues at other institutions. The recommendations are organized into the following five goals:

1. Revolutionize the programs through a centralized and democratic scientific and administrative structure.
 - Restructure the graduate programs into 5-7 non-overlapping thematic areas.
 - Create a program governance structure based on inter-departmental program committees, a Central Coordinating Committee, and an inter-program Curriculum Committee. Foster movement between programs and standardize core practices.
 - Centralize and expand administration and support for graduate students.
 - Alleviate departmental financial burden by using the Vagelos funds to support students in their first year.
 - Reduce financial barriers to supporting students and explore ways to endow the entire program.
2. Recruit the most talented students locally and globally.
 - Establish school-wide admissions standards and unify the process across programs.
 - Strengthen efforts to increase the number of diverse applicants.
 - Redesign a user-friendly VP&S central website for all programs.
 - Create an electrifying and exciting interview visit.
 - Increase the breadth and size of student body over time.
3. Equip students with the best possible scholarly education and research training.
 - Establish and communicate faculty and student expectations.
 - Expand the role of thesis mentoring committee.
 - Build great curricula and courses, redesign lab rotations, and redesign qualifying exams.
4. Give graduate students the resources and support they need to thrive.
 - Eliminate all avoidable financial hardships and reduce the burden of living in high cost-of-living city.
 - Create effective physical and virtual spaces for PhD students.
 - Provide career services to enhance skills and foster networking with alumni.
5. Provide faculty the resources and support needed to thrive as mentors and educators.
 - Enhance early career faculty access to and recruitment of students.
 - Help faculty become more effective mentors.
 - Increase financial support to provide a research environment that promotes outstanding science.

The current implementation plan is as follows:

- External Advisory Board reviews proposed program structure and additional recommendations (November 2023).
- Constitute an Implementation Committee that will survey the scientific community and define the graduate programs' thematic areas (January 2024).
- Designate directors for each program as well as assemble the Program Committees and a Central Coordinating Committee to harmonize and standardize practices across all programs (February 2024).
- Constitute the Curriculum Committee and revolutionize the best training program for our students that provides superb foundational knowledge in the biomedical sciences (Spring - Summer 2024).
- Develop guidelines to ensure transparent, fair, selective, and yet inclusive processes for admissions and PhD program requirements (Spring - Summer 2024)
- Obtain school (e.g., GSAS and VP&S) as well as University Senate and Trustee program approvals (Summer 2024 – Spring 2025). Once University approvals are acquired, facilitate external review.
- Enhance the student experience by exploring ways to provide additional benefits, create a student lounge, increase student well-being initiatives, and expand career services (Fall 2024). Immediately implement programs that will benefit the current students.
- Enhance resources and support for faculty, including mentoring practices (Fall 2024).
- Once University approvals are granted and the external review is completed, obtain the necessary New York State Education Department (NYSED) doctoral program approval (Spring 2025 – Summer 2026).
- Once NYSED approves the programs, redesign the website to showcase the new academic model for graduate education (Summer 2026).
- Implement new admissions procedures and recruitment plans (Fall 2026 and Spring 2027).
- The inaugural Vagelos Institute PhD cohort begins classes (Fall 2027. Note: This date is based on the estimated timeline for approvals.).

APPENDIX D:

Faculty Council Presentation by Dr. Hashim Al-Hashimi



TRANSFORMING GRADUATE PHD EDUCATION AT VP&S

Update on the
Vagelos Institute for Biomedical Research Education (VIBRE)

Faculty Council Meeting
January 29, 2024

Vagelos Institute for Biomedical Research Education

In 2023, Diana and Roy Vagelos generously gave \$175 million to launch the Vagelos Institute for Biomedical Research Education.

The Vagelos Institute will:

- Be home to PhD students
- Spur the training of more physician-scientists
- Create a new academic model



Defining Graduate PhD Education

“Current State” Task Force Members



Arthur Palmer III, PhD (chair)
Associate Dean of Graduate Affairs



Yinghui Mao, PhD
Assistant Dean for Graduate Affairs



Anthony Ferrante Jr., MD
Director of Graduate Studies, Nutritional and Metabolic Biology Program



Wesley Grueber, PhD
Director of Graduate Studies, Neurobiology and Behavior Program



Rebecca Haeusler, PhD
Director of Graduate Studies, Integrated Program in Cellular, Molecular, and Biomedical Studies



Michele Shirasu-Hiza, PhD
Director of Graduate Studies, Genetics and Development Program



Lorraine Symington, PhD
Director of Graduate Studies, Microbiology and Immunology Program

“Future State” Task Force Members



Hashim Al-Hashimi, PhD (chair)
Roy and Diana Vagelos Professor of Biochemistry and Molecular Biophysics



Dmitriy Aronov, PhD
Assistant Professor of Neuroscience



Henry Colecraft, PhD
John C. Dalton Professor of Physiology and Cellular Biophysics and Professor of Molecular Pharmacology and Therapeutics



Laura Johnston, PhD
Professor of Genetics and Development



Emily Mace, PhD
Assistant Professor of Pediatric Immunology (in Pediatrics)



Kenneth Olive, PhD
Associate Professor of Medicine



Samuel Sternberg, PhD
Assistant Professor of Biochemistry and Molecular Biophysics



Chunhua Weng, PhD
Professor of Biomedical Informatics



Danielle Matsushima, PhD
Senior Director of Strategic Research Initiatives
In the VP&S Office for Research

Biomedical Informatics (MDIF)
Cellular and Molecular Physiology & Biophysics (PHYG)
Genetics and Development (GEND)
Integrated Program in Cellular, Molecular,
and Biomedical Studies (CMBS)
Microbiology and Immunology (MICR)
Molecular Pharmacology and Therapeutics (PHAR)
Neurobiology and Behavior (NB&B)
Nutritional and Metabolic Biology (HNUT)
Pathobiology and Mechanisms of Disease (PATH)

Recommendation Process and Timeline

Current Model: Coordinated Programs in the Biomedical Sciences



MAY
2023

**TWO TASK
FORCES
LAUNCH**



JUNE – JULY
2023

**DATA COLLECTION
& IDEATION**



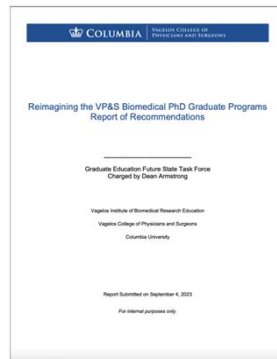
AUGUST
2023

**INTERNAL
REVIEW**



NOVEMBER
2023

**EXTERNAL
REVIEW**



Recommended Five Goals for Transformation

-  Revolutionize the programs
-  Recruit talent locally and globally
-  Provide the best education & research training
-  Give students resources to thrive
-  Enable faculty to thrive as mentors and educators

Recommendation 1



Key Tasks:

- 1) Restructure graduate programs.
- 2) Create program governance structure:
 - a) Establish inter-departmental program committees
 - b) Establish a Central Coordinating Committee.
 - c) Establish an inter-program Curriculum Committee.
- 3) Foster movement between programs.
- 4) Standardize core practices.
- 5) Centralize and expand OGA administration and support.
- 6) Build a central website.
- 7) Look for opportunities to endow the entire program.

Recommendation 2



Key Tasks:

- 1) Strengthen efforts to increase # of diverse applicants.
- 2) Create a user-friendly VP&S central website for all programs.
- 3) Create electrifying and exciting interview visit.
- 4) Establish school-wide standards of admission.
- 5) Unify the admissions process across programs.
- 6) Increase the breadth and size of student body over time

Recommendation 3



Key Tasks:

- 1) Establish and communicate faculty expectations.
- 2) Establish and communicate student expectations.
- 3) Expand the role of thesis mentoring committees.
- 4) Create school-wide standards:
 - a) Build great curricula and courses.
 - b) Redesign lab rotations.
 - c) Redesign qualifying exams.
- 5) Reduce financial barriers to supporting students.

Recommendation 4

-  Revolutionize the programs
-  Recruit talent locally and globally
-  Provide the best education & research training
-  Give students resources to thrive
-  Enable faculty to thrive as mentors and educators

Key Tasks:

- 1) Eliminate all forms of avoidable financial hardship.
- 2) Reduce burden of living in high cost-of-living city.
- 3) Provide supplemental funds to attract and retain talent.
- 4) Eliminate ineffective institutional support via OGA restructure.
- 5) Empower students to shape graduate programs.
- 6) Support community building.
- 7) Create effective physical and virtual spaces for PhD students.
- 8) Provide career services and networking with alumni.
- 9) Create opportunities to enhance skills for professional dev.
- 10) Clarify mentorship expectations.

Recommendation 5

-  Revolutionize the programs
-  Recruit talent locally and globally
-  Provide the best education & research training
-  Give students resources to thrive
-  Enable faculty to thrive as mentors and educators

Key Tasks:

- 1) Enhance faculty access and recruitment of students.
- 2) Help faculty become more effective mentors.
- 3) Increase financial support to provide a research environment that promotes outstanding science.

Implementation Process and Timeline

Current Model: Coordinated Programs in the Biomedical Sciences



Implementation Process and Timeline

Task	2024												2025											
	Spring					Summer			Fall				Spring					Summer			Fall			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Form Implementation Committee	■																							
Determine new program areas (Goal 1)		■	■	■																				
Form Program Committees (Goal 1)				■																				
Form Central Coordinating Committee (Goal 1)					■																			
Form Curriculum Committee (Goal 1)						■																		
Identify and design core and program courses (Goal 3)							■	■	■	■	■	■	■	■	■	■	■	■	■					
Revamp admissions and recruitment (Goal 2)				■		■	■	■																
Launch new academic model with first cohort (Goal 1)																			■	■	■	■	■	
Enhance the student experience (Goal 4)						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Enhance resources to support faculty (Goal 5)						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

Implementation Priority Areas



Reimagine the training program areas



Develop an outstanding curriculum



Prioritize student wellness

Questions

Admission Process and Outcomes

- Average 1,250 applications with a constant increase of applications in recent years.
- Applicants choose from 13 different programs/tracks with one primary option and one secondary option.
- Each program/track independently runs the admissions process with an Admission Review Committee.
- ~300 applicants are invited for an on-site visit during February and March.
- Each program proposes a group of applicants to be admitted for approved by the Associate Dean.
- ~150 applicants are admitted every year, which constitutes an average of 12% selectivity. However, due to the size of the applicant pool, the average selectivity varies among each individual program/track from 8% to 33%.

Guiding principles

- Build an **unrivaled academic research community** that makes Columbia the ultimate destination for budding scientists to nurture and launch their independent careers.
- Create a **new academic model** that instills a sense of purpose within the community members, fosters a deep-seated passion for science as a vocation, and encourages intellectual risk-taking and bold experimentation needed to make historic advances in health science research.
- Cultivate an **inclusive academic research environment** and supportive ecosystem that **celebrates diversity** and has a sustained commitment to providing student-centric mentoring and education.
- Increase the **quality of the graduate program** and build a deep sense of community and purpose by democratizing the process through which training programs are managed and evolved over time.
- Increase and **facilitate improved communication and coordination** between various stakeholders on campus.
- **Simplify, streamline, and standardize PhD program requirements** and administrative processes to increase efficiency and alleviate burdens on faculty and students.
- Build on and take advantage of existing strengths across programs and **eliminate redundancies**.
- **Reduce the disproportionate financial burdens** that deter historically marginalized groups from pursuing a career in science, making equity and accessibility a central pillar of our program.
- **Recalibrate the mentor-mentee dynamic** and build relationships centered on trust.
- Normalize, destigmatize, and **provide support for pursuing careers outside of academia** to foster leaders that are expertly skilled to tackle challenges pertaining to human health.
- **Relieve the financial stress of funding trainees** for all mentors, but especially for early career faculty.

APPENDIX E:

Letter of Support

Katrina Armstrong, MD



*Dean of the Faculties of Health Sciences and
the Vagelos College of Physicians and
Surgeons*

*Executive Vice President for Health and
Biomedical Sciences*

*Harold and Margaret Hatch Professor in
the Faculty of the University*

April 12, 2023

Mary C. Boyce, PhD
Office of the Provost
Columbia University
205 Low Memorial Library
535 West 116th Street
New York, NY 10027

Dear Mary:

I submit for your approval and recommendation to the Trustees at their May 2023 meeting the establishment and naming of a new institute to advance Columbia University Vagelos College of Physicians and Surgeons (VP&S) as a leading institution for training in biomedical research, the "Roy and Diana Vagelos Institute for Biomedical Research Education" at VP&S (the Institute). The Institute will position Columbia as an unparalleled leader for fostering the careers of scientists and physician-scientists.

The Institute will be dedicated to developing a new academic model, one that encourages and supports the sort of intellectual risk-taking needed for transformative discoveries in the health sciences. The goal of the Institute is to create supportive career pathways, promising stability and academic freedom, in order to attract more students and junior faculty to the essential endeavor of biomedical research. Currently in the United States, PhD students, MDs in training, residents, fellows, and early-career physician-scientists who pursue a career in basic, translational or clinical research must contend with both financial challenges and professional uncertainty¹.

The Institute will encompass and oversee the programs made possible by the transformative gift of \$175 million from P. Roy Vagelos, MD and Diana Vagelos, pledged in October, 2022. Of their gift, \$125 million will be used to establish an endowment to support PhD students conducting their training with faculty members in VP&S departments. This support will allow VP&S to transform the model by

¹ The number of physician-scientists has dwindled over recent decades due largely to the challenges for medical trainees and early-career MDs interested in research careers. A 2017 NEJM article, "[Saving the Endangered Physician-Scientist—A Plan for Accelerating Medical Breakthroughs\(link is external and opens in a new window\)](#)," cites finances and funding as the top issues contributing to the decline in number of physicians.

Vagelos College of Physicians and Surgeons
Columbia University Irving Medical Center

630 West 168th Street, New York, NY 10032

Telephone: 212.305.2752 Fax: 212.305.3617 Email: kaa2210@cumc.columbia.edu

which graduate students are funded and to revamp the graduate curriculum to maximize training opportunities for PhD students. \$50 million will be used to support programs that develop an integrated and comprehensive physician-scientist training pathway to ensure medical students, resident trainees, fellows, and early career faculty members have the necessary funding and protected time to pursue research interests and establish themselves as independent physician-scientists.

Anchored at the Vagelos College of Physicians and Surgeons, the Institute will be led initially and on an interim basis by me as Dean of VP&S and EVP for Health and Biomedical Sciences. As outlined in the gift agreement for the Vagelos' commitment, The Institute will be governed by a steering committee which I will chair. The committee will oversee and establish guidelines for the programs to be developed as part of the Institute's activities. The committee also will empanel an external scientific advisory board (ESAB) to impart additional expertise from leaders in the field of graduate biomedical education as these new PhD and Physician Scientist Pathways programs are developed. Initial members of the ESAB include: Enrique M. De La Cruz, PhD, of the Yale School of Medicine; Tracy Johnson, PhD, of UCLA; William Kaelin Jr., MD, of the Dana-Farber Cancer Institute; and Shirley M. Tilghman, PhD, of Princeton University. Any VP&S faculty member who participates in the training of students, residents, or fellows as part of the programs made possible by the gift shall be considered members of the institute.

As a measure of gratitude for this remarkable generosity, we therefore respectfully seek your and the Trustees' approval to establish and name the "Roy and Diana Vagelos Institute for Biomedical Research Education" at VP&S in perpetuity.

Among the most generous benefactors in the history of the University, Dr. Roy Vagelos is an international authority on lipid biochemistry, physiology, and pharmacotherapy and is one of the leading research visionaries of his generation. He became Chief Executive Officer of Merck following an authoritative career as a cardiologist, biochemist, Department Chairman, and highly productive scientist focusing on the biosynthesis and control of cholesterol. Spanning enzyme research, molecular genetics, human trials, and the development and marketing of statins, his career ushered in the current era of preventive cardiovascular medicine.

Dr. Vagelos is married to Diana Vagelos (nee Touliatos), an alumna of Barnard College at Columbia University. Diana Vagelos continues to be involved with her alma mater, where she is Vice Chairman of the Board of Trustees.

Dr. Vagelos received his A.B. degree in 1950 from the University of Pennsylvania, where he was elected to Phi Beta Kappa, the academic honor society. He received his M.D. from Columbia University in 1954 and was elected to Alpha Omega Alpha, the medical honor society. From 1954-1956, he completed his internship and residency at Massachusetts General Hospital in Boston. From 1956-1966, he served at the National Heart Institute, in Bethesda, Maryland holding positions in cellular physiology and biochemistry, first as Senior Surgeon and then as Head of Section of Comparative Biochemistry, both in the Laboratory of Biochemistry. It was during this time that he started his fundamental research on lipid metabolism and discovered the acyl-carrier protein (ACP), a key factor in this process. In 1966, Dr. Vagelos joined Washington University in St. Louis, Missouri, as Chairman of the Department of Biological Chemistry of the School of Medicine in St. Louis, Missouri where he founded and became Director of the University's Division of Biology and Biomedical Sciences. In so doing, he established an unprecedented model for the fusion of a Medical School with an undergraduate Department of Biology, a model that many other universities were soon to emulate. Dr. Vagelos joined Merck in 1975 as Senior Vice President of Research and became President of its research division in 1976. From 1984-1994, Dr. Vagelos served as Chief Executive Officer of Merck & Co. Inc. Dr. Vagelos has served on the Board of Trustees at the University of Pennsylvania from 1988 until 1999, of which he was Chair from 1995 to 1999, as well as Chair of the Trustees Executive and Nominating Committees and is a member of the undergraduate financial aid committee and the Agenda for Excellence Council. Upon his retirement from the Board, he was named

Trustee Emeritus. He is currently Chairman of Regeneron Pharmaceuticals, Inc. and Theravance, Inc., two biotech companies.

Dr. Vagelos is the author of more than 100 scientific papers and an elected member of the National Academy of Sciences, as well as the Institute of Medicine, the American Academy of Arts and Sciences, and the American Philosophical Society. For his seminal work on ACP and leadership of Merck, Dr. Vagelos was awarded the American Chemical Society's Enzyme Chemistry Award in 1967, the National Academy of Science's Chemistry in Service to Society Award in 1995 and was inducted into the National Business Hall of Fame in 1995. In 1998, the School of Arts and Sciences bestowed upon him its Distinguished Alumni Award in recognition of his lifetime achievements in the sciences and humanities, and in 1999 he was honored by the Franklin Institute with the Bower Award for Business Leadership for his role in eradicating river blindness.

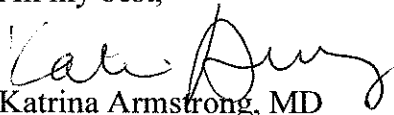
He is also, currently, Chairman of the Board of Advisors at Columbia University Vagelos College of Physicians and Surgeons, former co-Chair of the University Campaign, and Chair of the Columbia Climate Board of Advisors. He serves on a number of public policy and advisory boards, including the Donald Danforth Plant Science Center and the Danforth Foundation.

The Vageloses current philanthropic activities are rich and varied and continue to span academia through medicine to industry. At the University of Pennsylvania, they donated over \$15 million dollars to create the Roy and Diana Vagelos Laboratories. These funds also made possible the founding of the Vagelos Scholars Program in Molecular Life Sciences, an intensive program offered to University of Pennsylvania freshmen. In addition, they donated funds to launch the Vagelos Program in Life Sciences and Management, a joint program between the Wharton School at the University of Pennsylvania and its College of Arts and Sciences. They also founded the Vagelos Integrated Program in Energy Research, supporting the necessity of energy research.

In 2010, Dr. Vagelos and Diana Vagelos donated \$50 million dollars to the Columbia College of Physicians and Surgeons towards the construction of a new building named the Roy and Diana Vagelos Education Center, it opened in August 2016. In 2017, Dr. and Mrs. Vagelos made an historic commitment of \$250,000,000 to the medical school in support of student financial aid, scientific research, and faculty support. In recognition of their unparalleled commitment to the student, patients, and faculty at Columbia, the medical school was renamed as the Vagelos College of Physicians and Surgeons. They have contributed a total of approximately \$500 million to Columbia.

As a testament to Roy and Diana's lifetime of generosity and dedication to the advancement of science and medicine, I am pleased to provide my full and enthusiastic support for the establishment and naming of the Vagelos Institute for Biomedical Research Education.

All my best,


Katrina Armstrong, MD

APPENDIX F:
Proposed Funding Model



COLUMBIA

VAGELOS COLLEGE OF
PHYSICIANS AND SURGEONS

**Vision to Transform Graduate Education and Research Training at the
Vagelos College of Physicians and Surgeons**

THE VAGELOS INSTITUTE FOR BIOMEDICAL RESEARCH EDUCATION

Two-Part Approach to become the nation's leading graduate school in the biomedical sciences.

Part 1: Transforming the Graduate Program

Graduate Program Endowment

```
graph TD; A[Graduate Program Endowment] --> B["$125M endowment generates approx. $6,400,000 of income each year"]; B --> C[Stable Funding and Better Options for PhD students];
```

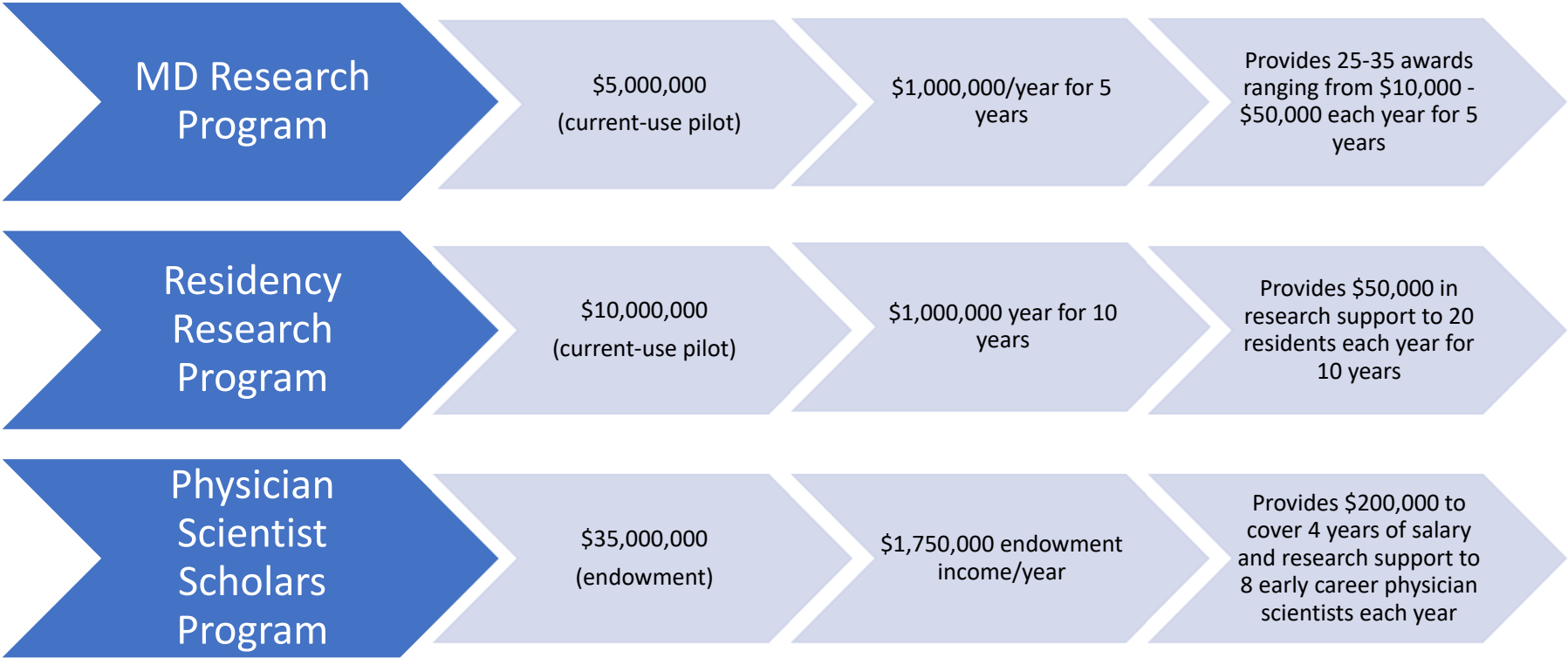
\$125M endowment generates approx. \$6,400,000 of income each year

- \$3.1 covers cost of 1st year PhD Students
- Remaining annual endowment income will provide funding to support students in years 2-3 not covered by training grants, and cover University fees for students in years 4-5.

Stable Funding and Better Options for PhD students

- New model allows students more time to build skills & interests before choosing a specialty/training grant
- Endowment ensures secure funding for PhD students in years 1-3; Years 4-5 covered by P.I. grants

Part 2: Building Physician Scientist Research Pathways



Physician Scientist Scholars Program: Income of \$1,750,000/year from endowment of \$35M would support 8 awardees, beginning with 2 in the first year and adding 2 each year, until reaching 8 awardees in year 4. As the endowment grows, number of awards may increase.

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
	\$1,750,000	\$3,100,000	\$4,050,000	\$4,600,000												
\$	(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)												
\$	(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$4,750,000											
	\$1,350,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)											
		\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$4,900,000										
		\$2,300,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)							
			\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$5,050,000									
			\$2,850,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)								
				\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$5,200,000							
				\$3,000,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)						
					\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$5,350,000						
					\$3,150,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)						
						\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$5,500,000					
						\$3,300,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)					
							\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$5,650,000				
							\$3,450,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)				
								\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$5,800,000			
								\$3,600,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)		
									\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$5,950,000		
									\$3,750,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	
										\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$6,100,000	
										\$3,900,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)
											\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$6,250,000
											\$4,050,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)
												\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$6,400,000
												\$4,200,000	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)
													\$(200,000.00)	\$(200,000.00)	\$(200,000.00)	\$(200,000.00)
														\$(200,000.00)	\$(200,000.00)	\$6,550,000
														\$4,350,000	\$(200,000.00)	\$(200,000.00)
															\$(200,000.00)	\$(200,000.00)
															\$4,500,000	\$(200,000.00)
																\$(200,000.00)
																\$4,650,000
																\$(200,000.00)
																\$(200,000.00)
																\$4,800,000
																\$(200,000.00)
																\$(200,000.00)
																\$4,950,000

Key

- Class 1: Green
- Class 2: Yellow
- Class 3: Blue
- Class 4: Pink