

COLUMBIA UNIVERSITY SENATE
ELECTIONS COMMISSION

February 24, 2015

Re: University Senate Reapportionment

Sharyn O'Halloran
Chair, Executive Committee
Columbia University Senate
535 West 116th Street
New York, NY 10027

Dear Senator O'Halloran:

On behalf of the University Senate Elections Commission, I am pleased to submit the enclosed report and recommendations for reapportionment of seats in the University Senate. Based upon its analysis of population shifts within the University, the Commission recommends two one-seat adjustments to the current apportionment.

Section 21 of the University Statutes requires that eighty-two of the Senate's 108 seats be reapportioned every five years among the faculties of the Columbia Corporation and its affiliated institutions. The seats subject to reapportionment are forty-two for tenured officers of instruction, sixteen for non-tenured officers of instruction, and twenty-four for students. The last reapportionment occurred in 2009–10 and was effective for the Senate's spring 2010 elections. The present reapportionment will be effective from the Senate's spring 2015 elections until the next scheduled reapportionment in 2019–20.

The enclosed report is intended to satisfy the Elections Code provision that the Commission "advise the Senate" on the reapportionment process. While preparing this report, the Commission consulted with the Provost's Office of Planning and Institutional Research to obtain the most accurate and up-to-date population figures for the applicable Senate constituencies. With assistance of staff and the Senate parliamentarian, the Commission analyzed these data alongside relevant provisions of the University Statutes and Elections Code to determine the appropriate apportionment of Senate seats. These determinations form the basis of the Commission's recommendation that two one-seat changes be made to the current apportionment of seats.

The Commission expresses its further thanks to Benjamin Brickner, the chair of the Elections Commission in 2009–10, on whose excellent work in the previous reapportionment exercise this report is based.

I commend this report to your attention and respectfully request that it be forwarded to whomever its contents may concern.

For the Elections Commission,

Samuel E. Roth, chair

cc: Lee Bollinger, President, Columbia University
Philip Genty, chair, Structure and Operations

COLUMBIA UNIVERSITY SENATE
ELECTIONS COMMISSION

To: The Columbia University Senate
DATE: February 24, 2015
RE: 2015 Quinquennial Reapportionment Report

EXECUTIVE SUMMARY

Section 21 of the University Statutes requires the Senate to reapportion eighty-two of its 108 seats every five years among the faculties of the Columbia Corporation and its affiliated institutions.¹ Seats subject to reapportionment are forty-two for tenured officers of instruction, sixteen for non-tenured officers of instruction, and twenty-four for students.

The Elections Code provides that the Elections Commission shall “advise the Senate” on the quinquennial reapportionment of seats.² This report is intended to fulfill this charge by presenting (1) populations of each constituency to be reapportioned, (2) their changes since the last reapportionment, and (3) the Commission’s recommendations for reapportionment of seats. Based upon its analysis of the population data, and application of relevant provisions of the University Statutes and Elections Code, the Commission recommends:

- That the tenured members of the Faculty of Arts and Sciences associated with the Social Sciences receive one fewer seat, and
- That the tenured members of the Faculty of Arts and Sciences associated with the Pure (Natural) Sciences receive one additional seat.

Reapportionment last occurred in 2009–10, effective for the Senate’s spring 2010 elections. The present reapportionment will be effective from the Senate’s spring 2015 elections until its next scheduled reapportionment in 2019–20.

This report proceeds with an overview of reapportionment followed by a description of the Commission’s process, analysis, and specific recommendations. Detailed population data are presented as appendices.

OVERVIEW OF SENATE REAPPORTIONMENT

Because the University Senate was founded as a representative assembly within a dynamic institution, the need for its periodic reapportionment is clear. Inevitable change in the relative size of the University’s faculties and schools requires occasional reallocation of seats to ensure the proportion of representation among the Senate’s constituencies remains stable over time.

In approaching its advisory role, the Commission was aided by Senate staff, especially Geraldine McAllister and Jessica Raimi, who provided insight into the Senate’s past practice of apportionment. Additionally, staff in the Provost’s Office of Planning and Institutional Research – particularly Lucy Drotning

¹ University Statutes, §§ 21(a)(1), (a)(2) and (b), *available at* http://secretary.columbia.edu/files/secretary/university_charters_and_statutes/University%20Charters%20and%20Statutes_June%202013.pdf.

² *Id.* § 6.

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and Zeid Sitnica – provided high quality population data for the Senate’s various constituencies. The Commission is grateful to these individuals for their assistance.

PROCESS, ANALYSIS AND RECOMMENDATIONS

The Statutes provide for periodic reapportionment of only three of the Senate’s eleven constituencies: (I) tenured officers of instruction, (II) non-tenured officers of instruction and (III) students. In each case, the apportionment language varies; the Commission adjusted its methodology in each case accordingly, as described below.

I. TENURED OFFICERS OF INSTRUCTION

The relevant language of the University Statutes reads as follows:

The forty-two memberships for officers of instruction having an appointment without stated term [i.e., tenured] as professor or associate professor . . . shall be apportioned by the University Senate every five years among the Faculties of the Columbia Corporation in proportion to the number of such officers of instruction; provided, however, that each such faculty, other than the Faculties of Arts and Sciences and Health Sciences, which shall not be entitled to elect any members, shall be entitled to elect at least one member; and for the purposes of this paragraph (1), apportionment and election of members from the Faculties of the College, General Studies and the Graduate School of Arts and Sciences, treated as one group, shall be among the three disciplines of the Social Sciences, Humanities, and Pure Sciences, respectively [Section 21(a)(1)]

Population data. Current population data for this constituency were provided by the Provost’s Office of Planning and Institutional Research. Historical data, used herein for comparison purposes, are available online at http://www.columbia.edu/cu/opir/abstract/faculty_staff.html. These data are summarized in Appendix A.1.

Because the Statutes specify officers of instruction having an appointment “without stated term,” included in this constituency are both traditionally tenured officers and those with “tenure of title.”³

Nineteen tenured officers of instruction hold multiple appointments within the University. For example, Peter Awn serves as both Dean of the School of General Studies (as an Officer of Administration) and Professor of Religion (as a tenured Officer of Instruction). To avoid counting these individuals in multiple Senate constituencies, the Commission has relied upon the Provost’s analysis of appointments data provided by the Columbia Corporation faculties. This analysis distinguishes between primary and secondary academic appointments, based upon the salary and full-time equivalency of each, enabling the Commission to assign individuals to a single constituency. For the present reapportionment, individuals holding multiple appointments have been counted in the constituency of their primary appointment.

³ This treatment is consistent with past practice. Additionally, *see* Columbia University Faculty Handbook (2008), <http://www.columbia.edu/cu/vpaa/handbook/instruction.html#tenureoftitle> (“Certain full-time officers of instruction in the Faculties of Dental Medicine, Medicine, Nursing, and Public Health who are not eligible for tenure may nonetheless receive tenure of title. While *those appointments are without stated term*, they do not provide a guarantee of salary from the University.”) (emphasis added).

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Apportionment methodology. Due to the specific numbers of tenured officers in each faculty, and the fixed number of tenured officer seats, the ideal number of seats for each constituency is fractional and simple rounding awards too many seats overall. Therefore, it is necessary to use a more sophisticated apportionment method that ensures both proportional representation and assignment of the correct number of seats.

Consistent with the 2010 reapportionment process, the Commission recommends that the Method of Equal Proportions be used to reapportion the University Senate. The U.S. House of Representatives has used this method since the 1950 census.⁴ This method ensures not only proportional representation and assignment of the correct number of seats, but also minimization of variation in persons-per-Senator among constituencies with multiple seats.⁵ Calculations necessary to apply this method are presented in Appendix A.3.

The Commission considered and rejected two alternative methods, including the fairly intuitive Largest Remainder Method and a method of modified rounding previously used by the Senate in 2005. Both suffer from serious deficiencies, including the potential for paradoxical results and arbitrarily large deviations from proportional representation among constituencies with multiple seats. These shortcomings led the Commission to reject both methods as inadequate. A description of these methods, their deficiencies, and a comparison of their apportionment results are presented in Appendix A.2.

Recommendations. Based upon its analysis of the population data, application of relevant provisions of the Statutes and Elections Code, and use of the Method of Equal Proportions described above, the Commission recommends two one-seat adjustments to the current apportionment of tenured faculty seats, specifically that:

1. The social sciences disciplines of the Arts and Sciences receive one fewer seat (for a total of 4 seats), and
2. The pure sciences disciplines of the Arts and Sciences receive one additional seat (for a total of 6 seats).

These changes reduce the variation in persons-per-Senator among both constituencies. The Commission's analysis and recommendations are presented in Appendix A.4.

⁴ See 2 U.S.C. § 2a(a) (2012). See also

<http://www.census.gov/population/www/censusdata/apportionment/>.

⁵ In mathematical terms, the Method of Equal Proportions uses an inverse geometric mean to minimize relative differences in persons-per-Senator among constituencies with multiple seats. For a more rigorous explanation, see Laurence F. Schmeckebier, *The Method of Equal Proportions*, 17 LAW & CONTEMP. PROBS. 302, 304–10 (1952).

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II. NON-TENURED OFFICERS OF INSTRUCTION

The relevant language of the University Statutes reads as follows:

The sixteen memberships for officers of instruction with stated term [i.e., non-tenured] shall be apportioned by the University Senate every five years among the Faculties of the Columbia Corporation other than the Faculties of Arts and Sciences and Health Sciences. . . . For the purposes of this paragraph (2), apportionment and election of members from the faculties of the College, General Studies and the Graduate School of Arts and Sciences, treated as one group, shall be among the three disciplines of the Social Sciences, Humanities, and Pure Sciences, respectively [Section 21(a)(2)]

Population data. Seventy-eight individuals in the Department of Athletics hold secondary appointments as Associates. As each of these individuals holds a primary appointment as an Officer of Administration (as, for example, a Head Coach or Head Trainer), they were not counted in the apportionment of Non-Tenured Officers of Instruction.

Apportionment methodology. Sixteen faculties of the University include non-tenured Officers of Instruction, corresponding with the sixteen statutory seats for non-tenured faculty.

Recommendations. The Commission recommends that each faculty receive one seat. The Commission's reapportionment analysis and recommendations are presented in Appendix B.2.

III. STUDENTS

The relevant language of the University Statutes reads as follows:

The twenty-four memberships for students shall be apportioned by the University Senate every five years as follows: twenty-two among the faculties of the Columbia Corporation; provided, however, that at least one student member shall be elected from each Faculty other than the Faculties of Arts and Sciences and Health Sciences; two additional student members shall be elected from the Faculty with the largest number of full-time students; one additional student member shall be elected from each of the Faculties with the next largest number of students; until the limit of twenty-two student seats for the Columbia Corporation is reached; one student member shall be elected from Barnard College; and one student member shall be elected from Teachers College. For the purposes of this subsection (b), the Faculty of the Graduate School of Arts and Sciences shall be treated as consisting of three separate faculties, comprised of the disciplines of the Social Sciences, Humanities, and Pure Sciences, respectively [Section 21(b)]

Population data. Most of the necessary current and historical population data for this constituency are available online at <http://www.columbia.edu/cu/opir/abstract/students.html>. Additional data on academic disciplines within the Graduate School of Arts and Sciences were provided by the Provost's Office of Planning and Institutional Research. These data are summarized in Appendix C.1.

During its analysis, the Commission encountered the following challenges: (1) reorganizing raw population data for reapportionment purposes, (2) determining whether non-degree students should be counted, and (3) determining whether part-time students should be counted.

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1. Assigning Students to Constituencies. Some Ph.D. candidates, although officially enrolled in the Graduate School of Arts and Sciences, pursue academic programs administered by other schools. (For instance, the Graduate School of Business administers a Ph.D. program, the degree for which is awarded by GSAS.) Consistent with past practice and OPIR's tabulation of the data, the Commission counted each student as part of the school that administers his or her program, rather than as part of GSAS.

Additionally, the Commission chose to aggregate thirty-four full-time students in the Office of Global Programs with students in the School of Continuing Education. All adjustments are reflected in Appendix C.1.

2. Non-degree students. In the 2010 reapportionment report, the Committee noted the presence of forty-four full-time non-degree students enrolled in Columbia programs. Lucy Drotning, Associate Provost in the Office of Planning and Institutional Research, indicates that the 2009 population data for non-degree students was erroneously low.⁶ Present data indicates 988 such students as of October 2014. Non-degree students include students participating in exchange programs, post-baccalaureate students, and others.

No single member of the Columbia community is affected by every item of business in the Senate. That said, much of the work of the Senate may affect degree students and non-degree students in equal measure. The Rules of University Conduct and the University's sexual assault policy, to pick two recent examples of Senate business, would be of similar interest and relevance to degree students and non-degree students alike.

Therefore, it is the recommendation of the Commission that the Senate, prior to the 2019–2020 reapportionment exercise, consider whether full-time non-degree students should be counted on an equal basis with full-time degree students for the purpose of reapportionment. The Commission, accordingly, has made two analyses of the apportionment of student seats: one that includes full-time non-degree students and one that does not. The Commission notes that, based on the present population date, each of the two analyses produces the same distribution of seats.

3. Full-time Students versus Headcounts. The relevant statutory language is clear that only full-time students are counted in the "Faculty with the largest number of full-time students [e.g., Columbia College]." However, it is unclear what types of students are counted in "each of the Faculties with the next largest number of students." The absence of "full-time" might suggest that all students are to be accounted for in some way (e.g., using a full-time plus part-time headcount). Alternatively, the presence of "next largest number" might suggest that the same full-time-only count should be used.

Upon consultation with Senate staff and the parliamentarian, the Commission chose to read the statutory language to require enumeration of only full-time students in each of the schools. This approach is consistent with past practice. Additionally, because the Statutes clearly require a full-time-only count in at least one school (that with "the largest number of full-time students"), this is the only approach that can treat all schools equally.

If the Senate were to deem it appropriate to count part-time students, there would be several ways to do so, including a headcount metric that would count full-time and part-time students equally, a full-time equivalency metric that would count part-time students at a fixed rate,⁷ or an *ad hoc* metric that would

⁶ By way of illustration, she reports further that in 2011, there were 941 full-time non-degree students enrolled at Columbia.

⁷ OPIR now uses this method, counting 3 part-time students as 1 full-time equivalency.

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part-time students variably, based upon an objective criterion such as the number of academic credits carried. The Commission notes that, depending on which metric were chosen, the present population data is such that the proper apportionment of student seats in the Senate could change.

In connection with its recommendations above, regarding further study of the questions regarding non-degree and part-time students, the Commission notes that neither the University Statutes nor the University Senate Elections Code define “student.” In resolving these questions, it may prove useful for the Commission or another Senate committee to propose such a definition for the Senate’s consideration. In any event, the Commission urges that these questions be taken up sufficiently in advance of the next reapportionment exercise to allow for their full consideration.

Apportionment Methodology. Unlike the sections regarding apportionment of faculty seats, section 21(b) of the University Statutes provides a specific method by which to distribute the seats for student Senators among the represented constituencies. Section 21(b) is excerpted in relevant part above.

Recommendations. Based upon its analysis of the population data, and application of relevant provisions of the Statutes and Elections Code, the Commission recommends no changes from the current apportionment of student seats.

Nonetheless, the Commission appreciates that a decision not to count part-time students adversely impacts schools with large numbers of such students (e.g., Continuing Education, General Studies, and Engineering); that it is inconsistent with many part-time students’ ability to run and vote in University Senate elections; and that it finds no stronger justification than part-time students’ lighter course loads. For these reasons, the Commission previously recommended that the Senate study whether part-time students should be counted for apportionment purposes, as part of the reapportionment report of 2010. It reiterates that recommendation today, and further recommends that the Senate make a similar study regarding non-degree students.

The Commission’s reapportionment analysis and recommendations are presented in Appendix C.2.

SUMMARY OF RECOMMENDATIONS

In this quinquennial reapportionment report, the Elections Commission has offered recommendations concerning apportionment of University Senate seats. A summary of all recommendations follows.

**Commission Recommendations Concerning
Apportionment of University Senate Seats**

| Tenured Officers of Instruction | Non-tenured Officers of Instruction | Students |
|--|--|--|
| A&S – Natural Sciences + 1 seat | all constituencies <i>no change</i> | all constituencies <i>no change</i> |
| A&S – Social Sciences – 1 seat | | |
| all other constituencies <i>no change</i> | | |

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2014–2015

Robert Brown, Jr.
*Frank Cardile Professor of Medicine and
Professor of Pediatrics
Division of Digestive and Liver Diseases*

Paul F. Duby
*Professor and Chair of the Department
Earth & Environmental Engineering*

Howard A. Jacobson
*Deputy General Counsel
Office of General Counsel*

Dana Neacsu
*Reference Librarian and Lecturer in Law
Diamond Law Library*

Samuel E. Roth, chair
*Student
School of Law*

Appendix A.1

Tenured Faculty Counts for Reapportionment*

| | Fall 2009 | | | Fall 2014 | | |
|--|------------|-------------------|---------------|--------------|-------------------|---------------|
| | Tenure | Tenure of Title** | Total Tenured | Tenure | Tenure of Title** | Total Tenured |
| ARTS AND SCIENCES | | | | | | |
| Columbia College, General Studies and GSAS | 397 | 0 | 397 | 430 | 0 | 430 |
| --Social Sciences | 119 | 0 | 119 | 122 | 0 | 122 |
| --Humanities | 140 | 0 | 140 | 148 | 0 | 148 |
| --Pure Sciences | 138 | 0 | 138 | 160 | 0 | 160 |
| International and Public Affairs*** | 10 | 0 | 10 | 14 | 0 | 14 |
| Arts | 10 | 0 | 10 | 11 | 0 | 11 |
| Continuing Education*** | 0 | 0 | 0 | 0 | 0 | 0 |
| MORNINGSIDE PROFESSIONAL SCHOOLS | | | | | | |
| Architecture, Planning, and Preservation | 13 | 0 | 13 | 18 | 0 | 18 |
| Business | 69 | 0 | 69 | 75 | 0 | 75 |
| Engineering and Applied Science | 105 | 0 | 105 | 129 | 0 | 129 |
| Journalism | 17 | 0 | 17 | 19 | 0 | 19 |
| Law | 63 | 0 | 63 | 71 | 0 | 71 |
| Social Work | 21 | 0 | 21 | 18 | 0 | 18 |
| MEDICAL CENTER PROFESSIONAL SCHOOLS | | | | | | |
| Dental Medicine | 7 | 8 | 15 | 5 | 5 | 10 |
| Medicine | 202 | 44 | 246 | 226 | 29 | 255 |
| Nursing | 5 | 0 | 5 | 5 | 0 | 5 |
| Public Health | 36 | 1 | 37 | 53 | 1 | 54 |
| UNIVERSITY TOTAL | 955 | 53 | 1,008 | 1,074 | 35 | 1,109 |

NOTES

Shaded rows indicate Senate constituencies

Source: Office of the Vice Provost for Academic Administration

* Only officers with primary academic appointments are included. Those with secondary appointments (e.g., deans who are also professors) are included in the not eligible for tenure may nonetheless receive tenure of title. While **those appointments are without stated term**, they do not provide a guarantee of salary from the University" (emphasis added). See <http://www.columbia.edu/cu/vpaa/handbook/instruction.html#tenureoftitle>.

*** The tenured faculty of Continuing Education (2009) consists entirely of joint appointments counted elsewhere.

Data as of early December

Appendix A.2

Comparison of Apportionment Results Using the Methods of (1) Largest Remainder, (2) Modified Rounding and (3) Equal Proportions

| Faculty or Academic Division <i>(descending order of 2014 population)</i> | 2009 Tenured Faculty | 2010 (Current) Seats | 2014 Tenured Faculty | (1) Largest Remainder | | (2) Modified Rounding | | (3) Equal Proportions | |
|--|----------------------------|----------------------------|----------------------------|--------------------------|--|--------------------------|--|--------------------------|--|
| | | | | 2015 Seats | Change From 2010 (Current) Seats | 2015 Seats | Change From 2010 (Current) Seats | 2010 Seats | Change From 2005 (Current) Seats |
| Medicine | 246 | 9 | 255 | 9 | <i>no change</i> | 5 | - 4 | 9 | <i>no change</i> |
| A&S – Pure Sciences | 138 | 5 | 160 | 6 | + 1 | 6 | + 1 | 6 | + 1 |
| A&S – Humanities | 140 | 5 | 148 | 5 | <i>no change</i> | 6 | + 1 | 5 | <i>no change</i> |
| Engineering and Applied Science | 105 | 4 | 129 | 5 | + 1 | 5 | + 1 | 4 | <i>no change</i> |
| A&S – Social Sciences | 119 | 5 | 122 | 4 | - 1 | 5 | <i>no change</i> | 4 | - 1 |
| Business | 69 | 3 | 75 | 2 | - 1 | 3 | <i>no change</i> | 3 | <i>no change</i> |
| Law | 63 | 2 | 71 | 2 | <i>no change</i> | 3 | + 1 | 2 | <i>no change</i> |
| Public Health | 37 | 2 | 54 | 2 | <i>no change</i> | 2 | + 1 | 2 | <i>no change</i> |
| Journalism | 17 | 1 | 19 | 1 | <i>no change</i> | 1 | <i>no change</i> | 1 | <i>no change</i> |
| Social Work | 21 | 1 | 18 | 1 | <i>no change</i> | 1 | <i>no change</i> | 1 | <i>no change</i> |
| Architecture, Planning, and Preservation | 13 | 1 | 18 | 1 | <i>no change</i> | 1 | <i>no change</i> | 1 | <i>no change</i> |
| International and Public Affairs | 10 | 1 | 14 | 1 | <i>no change</i> | 1 | <i>no change</i> | 1 | <i>no change</i> |
| Arts | 10 | 1 | 11 | 1 | <i>no change</i> | 1 | <i>no change</i> | 1 | <i>no change</i> |
| Dental Medicine | 15 | 1 | 10 | 1 | <i>no change</i> | 1 | <i>no change</i> | 1 | <i>no change</i> |
| Nursing | 5 | 1 | 5 | 1 | <i>no change</i> | 1 | <i>no change</i> | 1 | <i>no change</i> |
| Continuing Education* | 0 | 0 | 0 | 0 | <i>no change</i> | 0 | <i>no change</i> | 0 | <i>no change</i> |
| UNIVERSITY SENATE TOTAL | 1,008 | 42 | 1,109 | 42 | | 42 | | 42 | |

NOTES

The **Largest Remainder Method** allocates seats in three steps. First, the ideal number of persons-per-senator is determined by dividing the total population by the statutory number of seats available. Second, the minimum number of seats for each constituency is determined by dividing the constituency's total population ideal number of persons-per-Senator, rounded down to the nearest integer, with all constituencies receiving at least one seat. Third, additional seats, up to the statutory number of seats available, are awarded to constituencies with the largest remainders created during the first step, excluding those with populations less than the ideal number of persons-per-Senator. The Largest Remainder Method was used by the U.S. government from 1850 until 1910 to reapportion congressional seats among the states. See http://en.wikipedia.org/wiki/Largest_remainder_method. Despite its intuitiveness, this method suffers from several serious deficiencies, leading the Commission to reject its use. See <http://www.cut-the-knot.org/Curriculum/SocialScience/AHamilton.shtml>.

The **Method of Modified Rounding** was used by the University Senate in 2005 and allocates seats in three steps. First, the minimum number of seats for each constituency is determined by dividing the total population by the statutory number of seats available (this is the ideal number of persons-per-Senator), rounded down to the nearest integer, with all constituencies receiving at least one seat. However, the Faculty of Medicine is awarded zero seats in this step. Second, constituencies with remainders greater than or equal to 0.5 are awarded one additional seat. Finally, all remaining seats, up to the statutory number of seats available, are awarded to the Faculty of Medicine. Though this method was used previously by the Senate, it can lead to arbitrarily large deviations from proportional representation. For example, the Faculty of Medicine, with a population of 255, would receive the fewer seats than the humanities and pure sciences disciplines of the Arts and Sciences, with populations of only 148 and 160, respectively. For this reason, the Commission rejects this method.

The **Method of Equal Proportions** determines the priority ranking of additional seats for each constituency. Because each of 15 constituencies is entitled to at least one seat, priority rankings begin at 16. Additional seats from 16th to 42nd (the statutory number of tenured faculty seats) are then prioritized by multiplying a constituency's population by a multiplier that decreases in the number of seats already awarded to the constituency. The products are then ordered highest to lowest and constituency seats up to the 42nd are awarded. The "multiplier" is mathematically derived to minimize the variation in persons-per-Senator among constituencies with multiple seats.

* The Faculty of Continuing Education, having zero tenured officers of instruction, does not receive representation in this category. *But see* Appendix B.2 for non-tenured representation.

Appendix A.3

Ranking of Priority Values for Next Senate Seats in Each Constituency Using the Method of Equal Proportions

| Seat | Faculty or Division <i>(descending order of priority value)</i> | Next Seat | Priority Value | = | Population | x | Multiplier * |
|------|--|-----------|----------------|---|------------|---|--------------|
| 16 | Medicine | 2 | 180.3 | = | 255 | x | 0.7071 |
| 17 | AS/Pure Sciences | 2 | 113.1 | = | 160 | x | 0.7071 |
| 18 | AS/Humanities | 2 | 104.65 | = | 148 | x | 0.7071 |
| 19 | Medicine | 3 | 104.10 | = | 255 | x | 0.4082 |
| 20 | Engineering and Applied Science | 2 | 91.22 | = | 129 | x | 0.7071 |
| 21 | AS/Social Sciences | 2 | 86.27 | = | 122 | x | 0.7071 |
| 22 | Medicine | 4 | 73.61 | = | 255 | x | 0.2887 |
| 23 | AS/Pure Sciences | 3 | 65.32 | = | 160 | x | 0.4082 |
| 24 | AS/Humanities | 3 | 60.42 | = | 148 | x | 0.4082 |
| 25 | Medicine | 5 | 57.02 | = | 255 | x | 0.2236 |
| 26 | Business | 2 | 53.03 | = | 75 | x | 0.7071 |
| 27 | Engineering and Applied Science | 3 | 52.66 | = | 129 | x | 0.4082 |
| 28 | Law | 2 | 50.20 | = | 71 | x | 0.7071 |
| 29 | AS/Social Sciences | 3 | 49.81 | = | 122 | x | 0.4082 |
| 30 | Medicine | 6 | 46.56 | = | 255 | x | 0.1826 |
| 31 | AS/Pure Sciences | 4 | 46.19 | = | 160 | x | 0.2887 |
| 32 | AS/Humanities | 4 | 42.72 | = | 148 | x | 0.2887 |
| 33 | Medicine | 7 | 39.35 | = | 255 | x | 0.1543 |
| 34 | Public Health | 2 | 38.18 | = | 54 | x | 0.7071 |
| 35 | Engineering and Applied Science | 4 | 37.24 | = | 129 | x | 0.2887 |
| 36 | AS/Pure Sciences | 5 | 35.78 | = | 160 | x | 0.2236 |
| 37 | AS/Social Sciences | 4 | 35.22 | = | 122 | x | 0.2887 |
| 38 | Medicine | 8 | 34.08 | = | 255 | x | 0.1336 |
| 39 | AS/Humanities | 5 | 33.09 | = | 148 | x | 0.2236 |
| 40 | Business | 3 | 30.62 | = | 75 | x | 0.4082 |
| 41 | Medicine | 9 | 30.05 | = | 255 | x | 0.1179 |
| 42 | AS/Pure Sciences | 6 | 29.21 | = | 160 | x | 0.1826 |
| 43 | Law | 3 | 28.99 | = | 71 | x | 0.4082 |
| 44 | Engineering and Applied Science | 5 | 28.85 | = | 129 | x | 0.2236 |
| 45 | AS/Social Sciences | 5 | 27.28 | = | 122 | x | 0.2236 |
| 46 | AS/Humanities | 6 | 27.02 | = | 148 | x | 0.1826 |
| 47 | Medicine | 10 | 26.88 | = | 255 | x | 0.1054 |
| 48 | AS/Pure Sciences | 7 | 24.69 | = | 160 | x | 0.1543 |
| 49 | Medicine | 11 | 24.31 | = | 255 | x | 0.0953 |
| 50 | Engineering and Applied Science | 6 | 23.55 | = | 129 | x | 0.1826 |

NOTES

Unshaded areas indicate seats actually awarded

The Method of Equal Proportions determines the priority ranking of additional seats for each constituency. Because each of 15 constituencies is entitled to at least one seat, priority rankings begin at 16. Additional seats from 16th to 42nd (the statutory number of tenured faculty seats) are then prioritized by multiplying a constituency's population by a factor ("multiplier" above) that decreases in the number of seats already awarded to the constituency. The products are then ordered highest to lowest and constituency seats up to the 42nd are awarded. For example, the 42nd seat above is awarded to the Faculty of Law (its third seat). If the statutory number of tenured officer of instruction seats were increased to 43, the Faculty of Pure Sciences would be awarded another seat (its sixth).

The Method of Equal Proportions has been used by the U.S. since 1950 to reapportion the House of Representatives. See 2 U.S.C. § 2a(a) (2006); see also http://en.wikipedia.org/wiki/Huntington-Hill_method. This method minimizes the percentage differences in the number of persons-per-Senator among all constituencies with multiple seats.

That is, $1/\sqrt{n*(n-1)}$ where n = the next additional seat. This minimizes variation in persons-per-Senator among constituencies with multiple seats. See Laurence F. Schmeckebier, *The Method of Equal Proportions*, 17 Law & Contemp. Probs. 302, 304-10 (1952).

Appendix A.4

Recommended Reapportionment of Tenured Faculty Seats for the 2015–20 Sessions of the University Senate

| Faculty or Academic Division <i>(descending order of 2014 population)</i> | 2009 Tenured Faculty | 2014 Tenured Faculty | 2010 (Current) Seats | 2015 Seats | Change From 2010 (Current) Seats |
|--|----------------------------|----------------------------|----------------------------|---------------|--|
| Medicine | 246 | 255 | 9 | 9 | <i>no change</i> |
| A&S – Pure Sciences | 138 | 160 | 5 | 6 | + 1 |
| A&S – Humanities | 140 | 148 | 5 | 5 | <i>no change</i> |
| Engineering and Applied Science | 105 | 129 | 4 | 4 | <i>no change</i> |
| A&S – Social Sciences | 119 | 122 | 5 | 4 | – 1 |
| Business | 69 | 75 | 3 | 3 | <i>no change</i> |
| Law | 63 | 71 | 2 | 2 | <i>no change</i> |
| Public Health | 37 | 54 | 2 | 2 | <i>no change</i> |
| Journalism | 17 | 19 | 1 | 1 | <i>no change</i> |
| Social Work | 21 | 18 | 1 | 1 | <i>no change</i> |
| Architecture, Planning, and Preservation | 13 | 18 | 1 | 1 | <i>no change</i> |
| International and Public Affairs | 10 | 14 | 1 | 1 | <i>no change</i> |
| Arts | 10 | 11 | 1 | 1 | <i>no change</i> |
| Dental Medicine | 15 | 10 | 1 | 1 | <i>no change</i> |
| Nursing | 5 | 5 | 1 | 1 | <i>no change</i> |
| Continuing Education* | 0 | 0 | 0 | 0 | <i>no change</i> |
| UNIVERSITY SENATE TOTAL | 1,008 | 1,109 | 42 | 42 | |

NOTES

Pursuant to the University Statutes, Section 21(a)(1), "[t]he forty-two memberships for officers of instruction having an appointment without stated term as professor or associate professor as defined in Sections 60 or 61 shall be apportioned by the University Senate every five years among the Faculties of the Columbia Corporation in proportion to the number of such officers of instruction; provided, however, that each such faculty, other than the Faculties of Arts and Sciences and Health Sciences, which shall not be entitled to elect any members, shall be entitled to elect at least one member; and for the purposes of this paragraph (1), apportionment and election of members from the Faculties of the College, General Studies and the Graduate School of Arts and Sciences, treated as one group, shall be among the three disciplines of the Social Sciences, Humanities, and Pure Sciences, respectively, as specified in Section 153 of the Statutes."

As explained in the reapportionment report, these calculations are made using the Method of Equal Proportions, employed by the U.S. Census Bureau since 1950 to reapportion congressional seats among the several states. See 2 U.S.C. § 2a(a) (2006); see also http://en.wikipedia.org/wiki/Huntington-Hill_method. This method minimizes the percentage differences in the number of persons-per-Senator among all constituencies with multiple seats.

* The Faculty of Continuing Education, having zero tenured officers of instruction, has previously not received representation in this category. *But see* Appendix B.2 for non-tenured representation.

Appendix B.1

Non-tenured Faculty Counts for Reapportionment*

| | Fall 2009 | | | Fall 2015 | | |
|--|-----------------|---------------------|-------------------|-----------------|---------------------|-------------------|
| | Tenure Eligible | Non-tenure Eligible | Total Non-tenured | Tenure Eligible | Non-tenure Eligible | Total Non-tenured |
| ARTS AND SCIENCES | | | | | | |
| Columbia College, General Studies and GSAS | 184 | 135 | 319 | 155 | 223 | 378 |
| -- <i>Social Sciences</i> | 50 | 12 | 62 | 44 | 29 | 73 |
| -- <i>Humanities</i> | 68 | 105 | 173 | 48 | 159 | 207 |
| -- <i>Pure Sciences</i> | 66 | 18 | 84 | 63 | 35 | 98 |
| International and Public Affairs | 16 | 27 | 43 | 13 | 32 | 45 |
| Arts | 7 | 46 | 53 | 9 | 50 | 59 |
| Continuing Education | 0 | 24 | 24 | 0 | 25 | 25 |
| MORNINGSIDE PROFESSIONAL SCHOOLS | | | | | | |
| Architecture, Planning, and Preservation | 11 | 0 | 11 | 11 | 6 | 17 |
| Business | 66 | 14 | 80 | 52 | 12 | 64 |
| Engineering and Applied Science | 52 | 4 | 56 | 48 | 22 | 70 |
| Journalism | 8 | 12 | 20 | 5 | 10 | 15 |
| Law | 17 | 10 | 27 | 7 | 14 | 21 |
| Social Work | 19 | 3 | 22 | 22 | 3 | 25 |
| MEDICAL CENTER PROFESSIONAL SCHOOLS | | | | | | |
| Dental Medicine | 4 | 54 | 58 | 4 | 59 | 63 |
| Medicine | 204 | 1,488 | 1,692 | 187 | 1,515 | 1,702 |
| Nursing | 5 | 65 | 70 | 7 | 66 | 73 |
| Public Health | 45 | 86 | 131 | 40 | 81 | 121 |
| UNIVERSITY TOTAL | 638 | 1,968 | 2,606 | 560 | 2,118 | 2,678 |

NOTES

Shaded rows indicate Senate constituencies

Source Fall 2004: Office of the Vice Provost for Academic Administration, http://www.columbia.edu/cu/opir/abstract/faculty_rank_2004.html

Source Fall 2009: Office of the Vice Provost for Academic Administration

* Only officers with primary academic appointments are included. Those with secondary appointments (e.g., deans who are also professors) are included in the constituency of their primary appointment (e.g., administration members). Likewise, officers with multiple academic appointments are included in the

Data as of early December

Appendix B.2

Recommended Reapportionment of Non-tenured Faculty Seats for the 2015–20 Sessions of the University Senate

| Faculty or Academic Division <i>(descending order of 2014 population)</i> | 2009 Non- tenured Faculty | 2014 Non- tenured Faculty | 2005 (Current) Seats | 2010 Seats | Change From 2005 (Current) Seats |
|--|------------------------------------|------------------------------------|----------------------------|---------------|--|
| Medicine | 1,692 | 1,702 | 1 | 1 | <i>no change</i> |
| A&S – Humanities | 173 | 207 | 1 | 1 | <i>no change</i> |
| Public Health | 131 | 121 | 1 | 1 | <i>no change</i> |
| A&S – Pure Sciences | 84 | 98 | 1 | 1 | <i>no change</i> |
| Nursing | 70 | 73 | 1 | 1 | <i>no change</i> |
| A&S – Social Sciences | 62 | 73 | 1 | 1 | <i>no change</i> |
| Engineering and Applied Science | 56 | 70 | 1 | 1 | <i>no change</i> |
| Business | 80 | 64 | 1 | 1 | <i>no change</i> |
| Dental Medicine | 58 | 63 | 1 | 1 | <i>no change</i> |
| Arts | 53 | 59 | 1 | 1 | <i>no change</i> |
| International and Public Affairs | 43 | 45 | 1 | 1 | <i>no change</i> |
| Continuing Education | 24 | 25 | 1 | 1 | <i>no change</i> |
| Social Work | 22 | 25 | 1 | 1 | <i>no change</i> |
| Law | 27 | 21 | 1 | 1 | <i>no change</i> |
| Architecture, Planning, and Preservation | 11 | 17 | 1 | 1 | <i>no change</i> |
| Journalism | 20 | 15 | 1 | 1 | <i>no change</i> |
| UNIVERSITY SENATE TOTAL | 2,606 | 2,678 | 16 | 16 | |

Notes

Pursuant to the University Statutes, Section 21(a)(2), "The sixteen memberships for officers of instruction with stated term shall be apportioned by the University Senate every five years among the Faculties of the Columbia Corporation other than the Faculties of Arts and Sciences and Health Sciences. All such officers of instruction having an appointment as preceptor, associate, lecturer, instructor, and assistant professor, regardless of whether all such officers are full time or part time, shall be entitled to vote. Officers of instruction having an appointment with a stated term above that of assistant professor also shall be entitled to vote in this category. For the purposes of this paragraph (2), apportionment and election of members from the faculties of the College, General Studies and the Graduate School of Arts and Sciences, treated as one group, shall be among the three disciplines of the Social Sciences, Humanities, and Pure Sciences, respectively, as specified in Section 153 of the Statutes."

Appendix C.1

Full-time Student Enrollment Counts for Reapportionment

| | Fall 2009 Full-time Enrollment | Fall 2014 Full-time Degree Enrollment |
|---|--------------------------------------|--|
| ARTS AND SCIENCES | | |
| Columbia College | 4,363 | 4,576 |
| Graduate School of Arts and Sciences | 2,552 | 2,907 |
| ---- <i>Social Sciences</i> ** | 638 | 774 |
| ---- <i>Humanities</i> ** | 846 | 806 |
| ---- <i>Pure Sciences</i> ** | 984 | 1,327 |
| School of General Studies | 826 | 1,308 |
| School of International and Public Affairs | 1,164 | 1,226 |
| School of the Arts | 871 | 804 |
| School of Continuing Education and Special Programs | 404 | 421 |
| MORNINGSIDE PROFESSIONAL SCHOOLS | | |
| Graduate School of Architecture, Planning, and Preservation | 738 | 765 |
| Graduate School of Business | 2,012 | 1,871 |
| School of Engineering and Applied Science | 2,682 | 3,418 |
| Graduate School of Journalism | 344 | 333 |
| School of Law | 1,612 | 1,483 |
| School of Social Work | 813 | 860 |

Appendix C.1

Full-time Student Enrollment Counts for Reapportionment

| | Fall 2009 Full-time Enrollment | Fall 2014 Full-time Degree Enrollment |
|--|--------------------------------------|--|
| MEDICAL CENTER PROFESSIONAL SCHOOLS | | |
| College of Dental Medicine | 395 | 407 |
| College of Physicians and Surgeons | 1,378 | 1,461 |
| School of Nursing | 398 | 456 |
| School of Public Health | 669 | 1,100 |
| NON-DEGREE STUDENTS | 44 †† | 988 |
| UNIVERSITY TOTAL | 21,181 | 23,396 |

NOTES

Shaded rows indicate Senate constituencies

Source Fall 2009: Student Information Systems, http://www.columbia.edu/cu/opir/abstract/enrollment_fte_school_all.htm

Source Fall 2014: Student Information Systems, http://www.columbia.edu/cu/opir/abstract/enrollment_fte_school_all.htm

* Ph.D. students are reported in the schools that administer their programs.

** The Office of Planning and Institutional Research provided these data, which accounts for a slight discrepancy from the data available at http://www.columbia.edu/cu/opir/abstract/enrollment_fte_school_all.htm. GSAS

*** Consistent with past practice, the 34 non-degree students associated with the Office of Global Programs are counted as non-degree students at the School of Continuing Education.

† Includes degree and non-degree students

†† Information from the Office of Planning and Institutional Research indicates that this figure, used in the 2010 report, is *Data as of mid-October*

Appendix C.2

Recommended Reapportionment of Student Seats for the 2015–20 Sessions of the University Senate

| School or Academic Division <i>(descending order of 2014 full-time enrollment)</i> | 2009 Full-time Enrollment | 2015 Full-time Degree Enrollment | 2015 Full-time Enrollment | 2010 (Current) Seats | 2015 Seats (Degree students) | 2015 Seats (All students) | Change From 2010 (Current) Seats |
|---|---------------------------------|---|---------------------------------|----------------------------|---------------------------------------|---------------------------------|--|
| Columbia College | 4,363 | 4,576 | 4,650 | 3 | 3 | 3 | <i>no change</i> |
| School of Engineering and Applied Science | 2,682 | 3,418 | 3,421 | 2 | 2 | 2 | <i>no change</i> |
| Graduate School of Business | 2,012 | 1,871 | 1,883 | 2 | 2 | 2 | <i>no change</i> |
| College of Physicians and Surgeons | 1,378 | 1,461 | 1,726 | 1 | 1 | 1 | <i>no change</i> |
| School of Law | 1,612 | 1,483 | 1,518 | 1 | 1 | 1 | <i>no change</i> |
| GSAS – Pure Sciences | 984 | 1,327 | 1,327 | 1 | 1 | 1 | <i>no change</i> |
| School of General Studies | 826 | 1,308 | 1,308 | 1 | 1 | 1 | <i>no change</i> |
| School of International and Public Affairs | 1,164 | 1,226 | 1,227 | 1 | 1 | 1 | <i>no change</i> |
| School of Public Health | 669 | 1,100 | 1,100 | 1 | 1 | 1 | <i>no change</i> |
| School of Continuing Education | 404 | 421 | 956 | 1 | 1 | 1 | <i>no change</i> |
| School of Social Work | 813 | 860 | 860 | 1 | 1 | 1 | <i>no change</i> |
| School of the Arts | 871 | 804 | 810 | 1 | 1 | 1 | <i>no change</i> |
| GSAS – Humanities | 846 | 806 | 807 | 1 | 1 | 1 | <i>no change</i> |
| Graduate School of Architecture, Planning, and P | 738 | 765 | 780 | 1 | 1 | 1 | <i>no change</i> |
| GSAS – Social Sciences | 638 | 774 | 774 | 1 | 1 | 1 | <i>no change</i> |
| School of Nursing | 398 | 456 | 456 | 1 | 1 | 1 | <i>no change</i> |
| College of Dental Medicine | 395 | 407 | 413 | 1 | 1 | 1 | <i>no change</i> |
| Graduate School of Journalism | 344 | 333 | 333 | 1 | 1 | 1 | <i>no change</i> |
| <i>Non-Degree Students</i> | <i>44</i> | <i>988</i> | <i>n/a</i> | <i>--</i> | | <i>n/a</i> | <i>n/a</i> |
| Columbia Corporation Total | 21,181 | 23,396 | 24,349 | 22 | 22 | 22 | |
| Barnard College | | | | 1 | 1 | 1 | <i>no change</i> |
| Teachers College | | | | 1 | 1 | 1 | <i>no change</i> |
| Affiliated Institution Total* | | | | 2 | 2 | 2 | |
| UNIVERSITY SENATE TOTAL | | | | 24 | 24 | 24 | |

NOTES

Pursuant to the University Statutes, Section 21(b), "[t]he twenty-four memberships for students shall be apportioned by the University Senate every five years as follows: twenty-two among the faculties of the Columbia Corporation; provided, however, that at least one student member shall be elected from each Faculty other than the Faculties of Arts and Sciences and Health Sciences; two additional student members shall be elected from the Faculty with the largest number of full-time students; one additional student member shall be elected from each of the Faculties with the next largest number of students; until the limit of twenty-two student seats for the Columbia Corporation is reached; one student member shall be elected from Barnard College; and one student member shall be elected from Teachers College. For the purposes of this subsection (b), the Faculty of the Graduate School of Arts and Sciences shall be treated as consisting of three separate faculties, comprised of the disciplines of the Social Sciences, Humanities, and Pure Sciences, respectively, as specified in Section 153 of the Statutes."

* Pursuant to the Senate By-Laws, Section 1(g), the Union Theological Seminary may elect one non-voting student observer who enjoys a limited role in Senate deliberations.