ANTIOCH'S BIOLOGICAL SCIENCES AND HENRY FEDERIGHI

By Dr. Bernard Guyer '65

In September 1957, I was still 14-years-old and entering Detroit's newly-built Henry Ford High School (HFHS), a public school in a working class area of the city. Exactly one month later, on October 4th, the Russians launched Sputnik, initiating a revolution in American science education and shaping my academic career trajectory forever. In 1960, I enrolled in Antioch College in Yellow Springs, Ohio with the intention of majoring in biology and pre-medicine. Antioch led me to the University of Rochester Medical School in 1965 and, ultimately, to a successful and rewarding 40-year career as a pediatrician, professor of maternal and child health, and public health official. What links these major transitions is shown in the attached photo from the Antiochiana Archives.

Pictured is the August 26, 1949 marriage of Alexander Mercer[1]

[1] Alex Mercer also completed a M.S.T. degree at Antioch (Biology, Chemistry and Geology) and knew Federighi through this special summer program for high school science teachers.

(my HFHS biology teacher, faculty mentor to the enriched biology curriculum and life-long advisor and friend to Bessie D. Moore, a 1946 Antioch biology graduate, at the Universalist Unitarian Church in Detroit. The small, bearded, bespectacled, avuncular gentle-man in the pew just to the right is Henry Federighi- the "Chief"- head of the Biology Department at Antioch College, and the architect of the program that was instrumental to all of our successes. Ours is the story of how one key faculty member at a small liberal arts college in Ohio shaped the futures of a generation of scientists and medical doctors.

The research question

As a medical student at the University of Rochester School of Medicine and Dentistry in the late 1960s, I was aware that there were many Antioch graduates among both the students and faculty. At times I wondered why that was the case but never looked into it. When I joined the Antioch College Science Advancement Board in 2007, with the goal of helping the College to rebuild a seriously deteriorated program, however, I decided to go through the Alumni Directory and count the number of medical doctors and PhD scientists among the alumni. The task was easier, in general, for the MDs than for the PhDs since the exact field of doctoral work was often not specified. I was amazed at the record of such a small college in producing medical and science graduates. The research question became "what accounts for the strong record of Antioch in sending graduates on to careers in medicine and science?" But, again, it wasn't until I began to prepare my acceptance remarks for receiving the Horace Mann Award in 2018 that I seriously began to think about undertaking an archival research project to understand this history and the role of Henry Federighi, concluding that he was the architect of the program. I am grateful to Scott Sanders and the Antiochiana archives for enabling me to do this project.

The early history of science education at Antioch; a brief review

Like many successful efforts, the Antioch College science program was built on the earlier achievements of the College, under the leadership of Arthur Morgan, President of Antioch from 1920 to 1936. This early history is chronicled in Burton Clark's book, *The Distinctive College- Antioch, Reed, Swarthmore.*[2] Clark builds the case that Morgan's aim for Antioch was a "well proportioned education" alternating classroom study with applied work in industrial and research settings, thereby operationalizing the Co-operative education concept. An additional asset was the construction of a state-of-the-art Science Building in 1929; an Antioch College publication from the 1930s describe these foundations.[3] [4]

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[2] Clark, Burton R. The Distinctive College- Antioch, Reed, Swarthmore. Routledge 2017. Proquest Ebook central.

[3] Antioch College Bulletin. Vol. XXXIII, No. 4, January, 1937.

"Antioch is fortunate in having one of the most efficiently arranged and completely equipped science buildings that may be found on any college campus." The building was a gift of the industrialist and philanthropist Charles F. Kettering, a founder of the General Motors, in Dayton OH. Kettering located his own foundation to study photosynthesis in the building, adding yet more opportunities for student research in the program.

In addition, science education was integrally linked to the Co-operative education program developed during the 1920s. College documents from the 1960s highlight the expansion of job opportunities that students were able to take in medicine, science and industry. In some cases, Co-op jobs may have been the gateway to graduate school admission.

Finally, the College's early science education documents all emphasize the importance of student research, both through Co-op experiences and on-campus, course-related research projects and papers. The ability to carry out self-directed scientific research was essential to the curriculum.

Henry Federighi at Antioch

Henry Federighi was hand-picked by Morgan and appointed as a new assistant professor of biology at Antioch on May 29, 1929. The hiring of a faculty member in biology had been discussed at a joint meeting of the Executive Council and the

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[4] Science at Antioch. Vol. XXXXIV, No. 4, January, 1938.

Trustees on December 17, 1928.[5] Federighi came with an excellent academic background: undergraduate BS degree in biology from Rutgers (1923), MA at Harvard (1924) PhD in biology from Harvard (1926), and three years of experience as a biologist at the U.S. Bureau of Fisheries (1926-29). At the time of Federighi's appointment, the head of the biology program at Antioch College was O.L. Inman, who had also received his PhD in biology at Harvard (1921). In 1930, Inman became the Director of the C.F. Kettering Institute that was located on the top floor of the Science Building; he was focused on the study of chlorophyll and photosynthesis but continued to teach some courses in the College.[6]

Federighi's first few years were not distinguished. A discussion recorded in the Adcil (Administrative Council) minutes (1931-32) raised criticisms about his "loyalty" and "personal standards". Mr. Inman "felt that Federighi was lazy but that he had good relations with his students." "It was decided that Mr. (Arthur) Morgan would see Mr. Federighi again and tell him of all of the criticism. If he can change, he will be kept another year."[7]

By 1933, the Adcil minutes note that "[Federighi] was doing a fairly good job of teaching … and that it would not be wise to let [him] go at present. The issue was deferred until a later time."[8] A year later, on March 10, 1934, the Adcil minutes reported that his salary was raised to $2750, and on March 12, 1934 Federighi was promoted to associate professor. It is not clear what happened to bring about the change in his standing. One might speculate that the move of Mr. Inman away from the department gave Federighi more opportunity, responsibility and autonomy.

In 1939, Federighi was promoted to professor of biology, becoming the principal administrator and course instructor of the biology program. In the college catalogue, he is identified as the head of the Science department and is the principal instructor of the major biology courses and the pre-medical program.[9]

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[5] President's Office. Executive Council Meeting joint with Tristees, December 17, 1928.

[6] Ondess Lamar Inman. Chemistry Tree (online). https://academictree.org.

[7] Administrative Council Minutes, September 1931.

[8] Administrative Council Minutes, February 17, 1933.

[9] Administrative Council Minutes, 1939

Federighi served in these roles through to his retirement at the end of the 1959-60 academic year. He was granted a well deserved leave, went to Hawaii for a year's sabbatical, but died suddenly of a heart attack on November 30, 1960.[10]

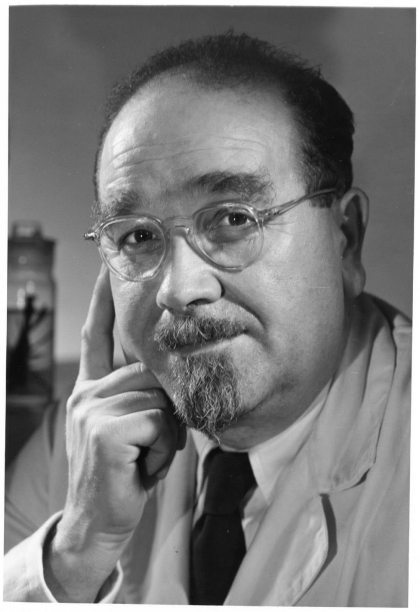
The pre-medical program at Antioch

The 1934-35 Antioch College Catalogue contains the first description of the "pre-medicine course"[11]. It is a bare-bone description with a short list of required biology and chemistry courses. Federighi is not listed as an instructor or administrator of the program.

The 1937-38 College Catalogue, however, contains a much-expanded 4-page description of the pre-medical "course" which is much more like a program description. Numerous courses and instructors are now listed, with Henry Federighi teaching, or co-teaching, most of them. They include General Biology, the introductory course where Federighi joins Mr. Inman and Mr. Nosker; Genetics and Eugenics is taught by Inman; Bacteriology, Federighi; Comparative Anatomy of Vertebrates, Federighi; Principles of Physiology, Federighi; General Embryology, Federighi; Entomology, not specified; and Special Elective Studies, Inman, Nosker, Federighi and Rothemund.[12]

By 1938, the College published a Bulletin designed to give concise and up-to-date information about the program to high school advisors. The pamphlet titled "*Science at Antioch*" lays out a philosophy of science as a key element of a liberal arts education, linking it to experiences through the Co-op program, research projects and the opportunities to learn scientific research methods in the modern Science Building.[13]

Thus, within 6-7 years of joining the Antioch faculty, Henry Federighi became the principal instructor of most of the biology courses that led to biomedical graduate education, including pre-medicine. Later College catalogues have even more extensive descriptions of the Antioch curriculum for those preparing for future careers in the biomedical sciences and professions. It should be emphasized,



[10] Antioch College News Bureau, Yellow Springs OH, Dec

[11] Antioch College Bulletin. Catalogue Issue. Vol 30. No. 8

[12] Antioch College Bulletin. Catalogue Issue, 1939

[13] Science at Antioch, Antioch college Bulletin, Vol. XXXI

however, that throughout this period, the biomedical program always included more than college course work; it incorporated Co-operative education opportunities to work in real-world medical settings, research opportunities including those at the college and through Co-operative jobs, and, although not explicitly stated, the life-long mentorship of Henry Federighi. Somewhere through these years, students began to call him the "Chief"!

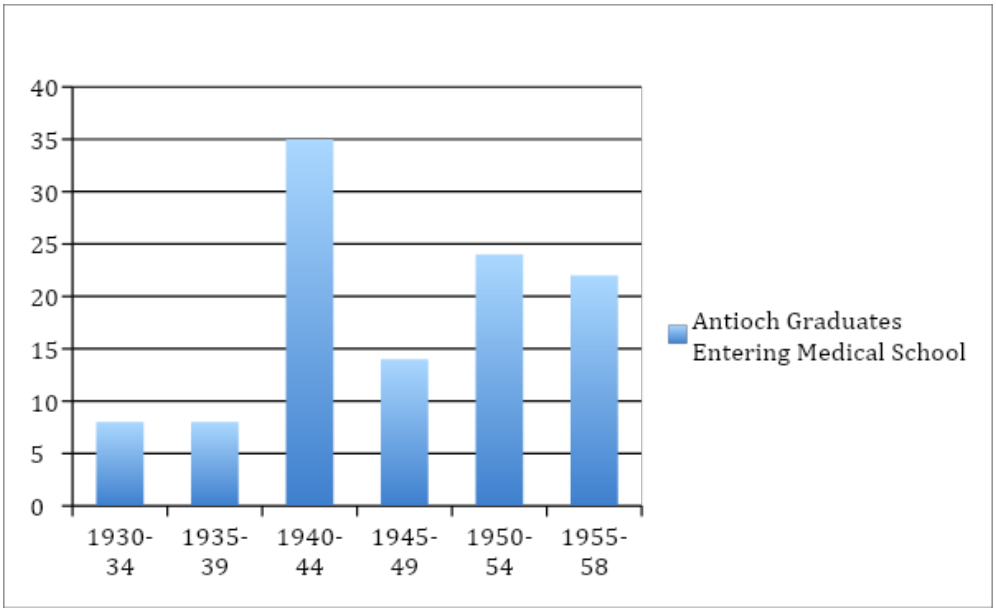
Program development and medical school enrollments:

While the development of the program is easy to document from College publications, actual growth of student enrollments and graduations is harder to assess. Chief Federighi kept personal, hand-written records of the graduates who went on to medical schools, although it is not clear how complete these records are. Between 1930 and 1959, he recorded data for 111 graduates enrolling in 31 medical schools; nearly half of all those graduates enrolled at three schools: 19 at Western Reserve, 18 at Rochester, and 14 at Harvard. The Harvard enrollments occurred primarily during the 30s.

Federighi's record of Antioch College graduates attending medical school 1930—59

MedSchool	Graduates	MedSchool	Graduates
Albany	1	Northwestern	3
Boston U	2	Ohio State	1
Buffalo	1	Pennsylvania	3
Chicago	3	Rochester	18
Columbia	3	Seton Hall	1
Cornell	4	Temple	2
Einstein	2	Tufts	1
GWU	3	UCLA	1
Hahnemann	1	Utah	1
Harvard	14	Virginia Med	3
JHU	2	Washington	2
McGill	5	Wayne	2
Michigan	6	Western Reserve	19
Minnesota	1	Womens Med	1
New York Med	1	Yale	3
NYU	1	**Total**	**111**

Enrollments began slowly as the program developed in the 1930s with 1-2 graduates entering medical school per year. Enrollments spiked during the war years with 35 enrollments in the 5 years from 1940 to 44. Finally medical school enrollments stabilized during the 1950s at 4-5 per year.



Federighi's Leadership and Mentorship

Although published four years after his retirement, a 1964 College Bulletin boasts about the achievements of the science program, clearly reflecting Federighi's influence over the previous 30 years:

"National studies repeatedly show Antioch to be one of a handful of American colleges that are pre-eminent in producing scholars and that have a contagious intellectual climate. Students come to Antioch capable: 75 per cent of them are in the top quarter of their secondary school classes. They gain substantially in knowledge at Antioch: over the past 5 years, Antioch science and engineering seniors have averaged well above the national mean for seniors taking the Advanced Tests of the Graduate Record Examination (Table I). And three-fourths of those majoring in science and engineering at Antioch go on to advanced study at graduate and professional schools all over the country, usually on scholarships (Table II).[14]

[14] Antioch College Bulletin. Science and Engineering, May, 1964.

I. Advanced Graduate Record Examinations, 1959-63		
Department and Test	Average score of Antioch seniors in terms of national percentiles	
Biology	85	Highest 15 percent nationally
Chemistry	81	Highest 19 percent nationally
Engineering	64	Highest 36 percent nationally
Geology	69	Highest 31 percent nationally
Mathematics	88	Highest 12 percent nationally
Physics	76	Highest 24 percent nationally

II. Graduate study, Antioch class of 1963	
Department	Seniors undertaking graduate study
Biology	81%
Chemistry	67%
Earth sciences	50%
Engineering	40%
Mathematics	80%
Physics	100%

Federighi's leadership of the Biology/Pre-medicine program is further demonstrated through the evidence of his ongoing monitoring of the status of Antioch graduates in national statistics for exam scores, admission rates to graduate schools and success in their programs. [AAMC data on MCAT scores]

The Federighi archive files have numerous copies of reports from the American Association of Medical Colleges (AAMC), comparisons of Antioch grads' performance as measured against other colleges, particularly those in Ohio, and other assessments. Table III, also from the AAMC, is based on a nine-year period, 1930-38 and covers all colleges with ten or more students in the freshman classes of U.S. medical schools. The data show numbers of students and, in percentages, those who completed the first year with a clear record, those who failed, and those who withdrew for some reason other than poor scholarship, such as lack of financial support, illness, personal issues, etc.

III. Performance of freshmen in medical school, by college, Ohio, AAMC, 1930-38					
Undergraduate College		Number	Clear %	Failed %	Withdrew %
Antioch	Yellow Springs	16	87.5	0.0	0
Ashland	Ashland	12	50.0	33.3	0
Baldwin-Wallace	Berea	20	60.0	15.0	5.0
Capital	Columbus	16	68.8	18.8	6.2
C. Wooster	Wooster	63	68.2	4.8	4.8
Denison U.	Granville	59	56.0	18.6	6.8

III. (cont.) Performance of freshmen in medical school, by college, Ohio, AAMC, 1930-38					
Heidelberg	Tiffin	27	70.4	14.8	0
Hiram	Hiram	19	68.4	26.3	0
John Carroll	Cleveland	80	65.0	16.2	6.3
Kent State	Kent	14	57.1	21.4	0
Kenyon	Gambier	25	48.0	20.0	8.0
Marietta	Marietta	40	57.5	15.0	7.5
Miami U.	Oxford	128	71.9	8.1	3.1
Mount Union	Alliance	73	64.4	16.4	8.5
Muskingum	New Concord	38	57.9	15.8	5.3
Oberlin	Oberlin	90	80.0	2.2	5.5
Ohio Northern	Ada	33	67.6	9.1	6.1
Ohio State	Columbus	323	73.7	8.3	3.1
Ohio U	Athens	113	69.0	6.1	2.6
Ohio Wesleyan	Delaware	101	72.3	12.9	2.9
Otterbein	Westerville	21	71.4	14.3	0
St. John's	Toledo	18	66.6	11.1	5.6
U. Akron	Akron	48	69.0	14.6	6.3
U. Cincinnati	Cincinnati	70	55.7	20.0	2.7
U. Dayton	Dayton	110	59.1	19.1	4.6
U. Toledo	Toledo	67	77.9	7.5	0
Western Reserve	Cleveland	162	74.1	6.2	3.7
Wilberforce	Wilberforce	38	34.2	18.4	2.6
Wittenberg	Springfield	69	62.3	24.6	4.3
Xavier U.	Cincinnati	107	56.0	9.3	7.5

Federighi's personal mentorship style can best be assessed through the dozens of letters in his files, many handwritten, to and from the Biology/Pre-med graduates at various stages of their career development trajectories and personal life decisions; doubtless there were even more that didn't make it into the archives. He sent out regular questionnaires to the graduates asking for details of family life events, academic achievements and career decisions.[15] It's no accident that Federighi attended the wedding of his student, Bessie D. Moore, even if it meant traveling to Detroit. He clearly loved and cared about his students and their families.

[15] An example is the 1955 biology-newsletter questionnaire.

Federighi's relationships with Medical Schools

Again, the evidence for how Federighi built the relationships that promoted the admission of Antioch students into medical schools is indirect and anecdotal.[16] We've already shown that the Antioch graduates were strong candidates and came with excellent academic credentials and work experience. But, Federighi also paved their way by developing strong relations to the medical schools. In the archives, we found two communications with Dean George H. Whipple at Rochester, suggesting that they had an understanding about the Antioch applicants to Rochester and communicated personally. He may have carried on correspondences with the deans of several other key medical schools about his graduating students, but I was not able to locate any of these.

Case study: University of Rochester and Antioch College

A few years ago, I had the pleasure of interviewing Dr. Ruth Lawrence (nee Anderson), a lively 90-year-old, respected pediatrician on the faculty of the University of Rochester. I remember her from the time that I was a medical student in the late 1960s. She graduated from Antioch in 1945 and despite an excellent academic record had difficulty being accepted into medical schools. That might be explained, in part, by the general bias against women at American medical schools, but also by the timing of her application when men were beginning to return from serving in WWII and reclaiming their positions in medical schools. Federighi suggested she visit Rochester. When she went to see Dean George H. Whipple (which must have been quite intimidating), he commented that he had received a strong recommendation letter from Federighi and accepted her into Rochester on the spot! Clearly, such a decision must have been built on a strong relationship of trust between the two leaders.

I visited Rochester's Miner Library and reviewed the content of some of the numerous boxes of Dean Whipple's correspondence from that period. Unfortunately I found no communications with Federighi or any file containing Antioch letters. I was told that when the Whipple archive was set up, many of the "routine" Dean's Office correspondence was discarded. I had found two letters between them in the Antioch records, both about specific Antioch student applicants to Rochester; there must have been others.

Combined list of Antioch-Rochester students

Name	Antioch degree	Entered UoR	Rochester degree
David Siegel	1943	1943	
Mary		1945	

[16] Weiss, Harry. "Federighi; The Oyster is his World" ? source

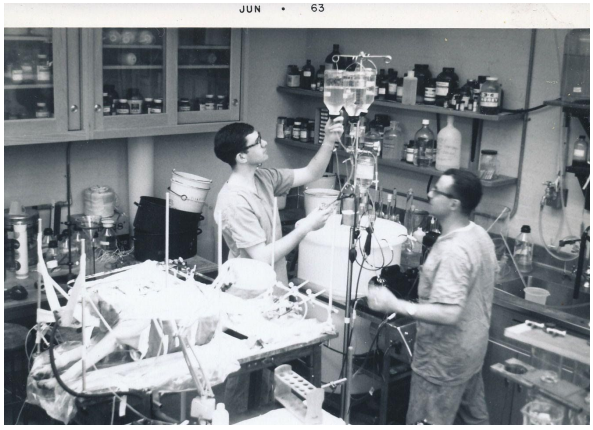
Name	Antioch degree	Entered UoR	Rochester degree
Seymour Reichlin	1945	---	Faculty 1960s
Earl Yonehiro	No degree	1948	
Ray Gambino	1948	1948	
Kyle King	1949	1949	
Don Andresen	1950	1949	
Robert Wielkens	1950	1950	
Douglas Hansen	1951	1951	1955 MD
Cyril Worby	1952	1952	1956 MD, Faculty
Gene Usty	---	1952	
George Mizner	1952	1952	
Robert Sparks	1952	1952	
Marjorie Cushman	1952	1952	
Stan Friedman	1953	1952	
Dick Pillard	1955	1955	
Charles Baker	---	---	
James Barter	1952	1957	1961 MD
Don Oliveau	1958	1958	MD
Doris Otto		1958	
Irvin Emanuel	Worked at Antioch	1950s	1960 MD
Edward Goldson	1962	1962	1966 MD
Alan Meyers	1962	1962	1966 MD
Paul Samuelson	1964	1964	1968 MD
Bernard Guyer	1965	1965	1970 MD
Donald Rushmer	1965	1965	1970 PhD
Richard Bolt	1966	1966	1970 MD
Eleanor Graham	1961-62	1966	1970 MD
Marina Zeiber	1970		1976 MD

Conclusions

The goal of this historical review was to understand how Henry Federighi crafted the ideas that built the Antioch Science/Medicine program. My personal dream was to find in the archives a program proposal, plan, concept paper or other kind of blueprint document that explicitly laid out the program strategies. But either such a document was never written or never recorded in the Adcil minutes and thus never survived. There is a possibility that the overall structure of the program simply emerged in a step-wise fashion without such a concept paper. In either case, the circumstantial evidence supports the conclusion that Federighi was the architect and builder of this program.

Guyer Photos of Rochester Co-op jobs:

Guyer in science lab



Guyer working as Co-op in renal physiology lab with Dr. Robert Siegel

U of R Physiology Department photo, 1964. Three Antiochians: Front, Left: Ken Geiger (Co-op), 3rd row 3rd from left: Anita Rui, doctoral candidate; 4th row, 2nd from right: Bernie Guyer.