MATHEMATICS AT DARTMOUTH

1769 - 1961

by

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Dedicatory Conference

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Dartmouth's poet, Richard Hovey, described the intellectual start of the College in the words:

"Eleazar was the Faculty,
And the whole curriculum
Was five hundred gallons of New England rum."

The last two lines may be undergraduate exuberance, but the first line is the truth. The Rev. Eleazar Wheelock, who founded the College in 1769, was Professor of Divinity (in addition to being President, Treasurer, and Trustee), and he was the only professor at Dartmouth for many years. The remainder of the instruction was given by tutors, recent graduates of Yale or of Dartmouth, under the easily understood assumption that if you had graduated from college, you were competent to teach any course in the college.

The first Professor of Mathematics was Bezaleel Woodward, who was promoted from Tutor in 1782. As would be true for many of his successors, he was a man of varied talents. He was Vice-President, Trustee, Treasurer, and Librarian of the College. He was a prominent politician, a Justice of the Municipal Court (he sent two college cooks to the whipping stand for stealing supplies), a noted Surveyor, Promoter of the Dartmouth College lotteries, and "Contractor" for the construction of the first permanent College building: Dartmouth Hall. His teaching activities comprised "advanced" arithmetic (alligation, false position, the mechanical powers, gauging), and algebra, plane and solid geometry, trigonometry, and surveying. This was the standard college fare of the times.

During the next 125 years he was followed by a succession of twelve worthies whose individual fortunes it seems hardly necessary to trace out. No one of them was in any sense a trained mathematician, and no one of them considered mathematics to be his inevitable career. It was not uncommon to begin as a tutor in Latin and Greek, be appointed to the chair of Mathematics (generally regarded as the least desirable regular post), and end up as Professor of Oratory and Belles Lettres.

A few names stand out. From 1810 to 1833 there was Ebenezer Adams, he of "the roaring voice" and the author of a best-selling text "The Scholar's Arithmetic", which on page 210 contained a set of "Pleasant and diverting Questions". It was a new idea to find pleasure and diversion, even briefly, in this dreadful mathematics.

And there was Stephen Chase, "Bruno" to the undergraduates, who for 13 long years was the most detested professor Dartmouth has ever known, and that is not a light statement. Mathematics was a requirement throughout Freshman and Sophomore years. Bruno, "tall, slim, sandy complexion, red hair", with his gift of exquisite sarcasm did nothing to ease this load. At the end of the Sophomore year an elaborate rite of burying the text-books was conducted, a rite with a real coffin, pallbearers, mourners, an ode, and an oration.

At the other extreme was James W. Patterson, in his time easily the most popular man in the College community. He had accepted the position of Professor of Mathematics, not that he cared at all for the subject, but because he wanted to be on the Faculty, and this was the only position open. President Lord was extremely critical of his scientific ability, and, reading between the lines, one guesses that his students were not over-worked. But while his mathematical talents may have been mediocre, his fame as an orator spread rapidly: he was twice elected to the national House of Representatives, and then became United States Senator. He returned briefly to his College, years later, as Professor of Oratory.

The one example of mathematical competency was furnished by Arthur Sherburn Hardy who wrote a book on quaternions, an adequate, if not inspiring text. It was something for Dartmouth to offer a course in such an abstruse field, and the course was actually given a few times when a student and an instructor could be found simultaneously. In 1893 Professor Hardy failed in his ambition to be elected President of Dartmouth College. He resigned, entered the diplomatic service, and was successively Ambassador to Turkey, Greece, Switzerland, and Spain. He was also a novelist with a

national reputation, and if a modern generation fails to find in his books the values which their great-grandfathers found, the fact remains that his books were best-sellers in their day.

The turning point in the College came in 1893 when Dr. Tucker was elected to the Presidency. He inherited a small, moribund college, probably the most orthodox and conservative institution in New England, with a Faculty which a not too charitable public believed to consist largely of broken-down Congregational ministers. It was a college which for years had been torn by wrangles between President, Trustees, Faculty, students and alumni. As assets he had:

(1) the reputation of the College as a citadel of freedom resulting from the Dartmouth College Case,

(2) a record of distinguished graduates,

(3) a loyal alumni body.

Dr. Tucker did everything. He healed the discords; he went out and engaged new and stimulating men as professors in the humanities, the sciences, and especially the social sciences. He immediately won the affection of the alumni, the Faculty recognized him as a leader, and his powerful personality was impressed on the students through his chapel talks. He was a community leader, he secured an adequate water system, and a competent fire department. You have to live in a small community to realize how much these last two things mean.

Every one spoke of "the new Dartmouth". A new vitality was apparent. Professors Nichols and Hull were doing research of fundamental importance in Physics. Other significant research names were Frost in Astronomy, Hitchcock in Geology, Bartlett in Chemistry, and Patten in Biology. There was no such activity in Mathematics. Two men, Frank Asbury Sherman and Thomas Wilson Dorr Worthen, with temporary help from Professor Hardy and an occasional tutor, had constituted the Department since the early 70's, and would continue until 1911, actually after Dr. Tucker had retired. These were men of standing and even eminence in the community. But they taught exactly as every Dartmouth Professor of Mathematics

had taught since the days of Bezaleel Woodward. A class meeting was literally a recitation, you recited on what you had "committed", or you were sent to the blackboard to work out a problem which you theoretically had done the night before. No mathematical lecture was ever given in the 19th century, and there was very little in the way of explanation. Dartmouth was, and too long would continue to be, a text-book college. The texts were announced in the college catalogue, and quite frequently you could use the books your father had used. There was no mathematical library at all. The concept of mathematical research had simply never occurred to any one on Hanover Plain. For 40 years "Frankie" Sherman, and "Tute" Worthen conducted recitations with terrific vigor, -- and complete lack of rigor.

Professor Nichols succeeded Dr. Tucker in the Presidency in 1909. Professors Sherman and Worthen were due to retire in 1911. President Nichols, himself a research physicist with an international reputation, wanted a top-notch mathematician who could take over, and so in 1909 Charles Nelson Haskins was elected Assistant Professor of Mathematics, with every expectation that he would be made Head of the Department two years later. An outstanding record at M.I.T. had won him a fellowship at Harvard where his graduate career was brilliant. He was the first mathematician to come to Dartmouth with an earned Ph.D., he had had considerable teaching experience. It looked like an excellent appointment.

To his aging colleagues who had probably never heard of an epsilon-delta proof, the rigorous standards of this young man must have seemed appalling. Under his skilfull handling (and uncanny knowledge of the market) the mathematical section of the library grew from zero to one of the very best college collections in the country. The Faculty, who had assumed that an M.I.T. graduate would be totally lacking in the humanities, were surprised to find that Haskins had mastered 12 languages, and could converse with any of them, on equal terms, and in German, on the merits of Goethe. His manual dexterity won the ungrudging respect of the Hanover artisans — a group that is not easily impressed. A man

who practically single-handed installs a complete plumbing system in an old rambling residence does not fit easily into the professorial pattern. He failed in only one respect — but here his failure was absolute — he could not teach Freshmen and Sophomores.

He was the first man in Hanover to lecture in mathematics; but his hand-writing was execrable, he constantly obstructed any view of the blackboard with his vast bulk, and the eraser in his left hand worked as steadily as the chalk in his right. It never occurred to him that students perversely prefer x, y, and z, to xi, eta, and zeta. These last were his favorites and he made them almost exactly alike. His students sat back in their seats, respecting his abilities, but completely failing to understand his terrific blasts of mathematical rigor. Fifty years ago, student nick-names for the Faculty were standard. They were not always complimentary, but they were pertinent. Inevitably he became "Hippo" Haskins.

In 1911, the Head of a Department really was the Head. He could hire, fire, and within limits set by the Trustees, fix all salaries. He defined the department curriculum, selected the text-books, and drew up the teaching assignments. The Trustees simply did not dare to give Haskins this power. Their choice fell on John Wesley Young. It was an excellent choice. Young had taught at Princeton and had collaborated with Veblen in the advanced text: "Projective Geometry", one of the few first class American productions of the early 20th century. His "Fundamental Concepts" was a pioneering effort, it had an extraordinary appeal to both the secondary and the college field -- fifty years later it is still surprisingly good reading. At Dartmouth he taught well, was held in high esteem by faculty and administration, and was a rather easy-going, democratic department head. As the College expanded, a steady stream of new teachers flowed into Hanover; a few moved on, a surprising number stayed. In 1919 when the new President, Ernest Martin Hopkins abolished the archaic Head of Department and established a rotating Chairmanship, a real democracy was achieved. A Dartmouth post became attractive to a young instructor in mathematics or in anything else.

There is bound to be conflict in a Department which contains a liberal, even radical leader like Young, and an ultra-conservative man like Haskins. It is not true that from 1920 on there were two opposing camps; there was, rather, a complete spectrum, with the moderates in the middle showing as much independence as the extremists.

Young would want to try a "modern" unified course such as Griffin's "An Introduction to Mathematical Analysis." Haskins could find virtue only in the orthodox Osgood and Graustein "Analytic Geometry." We would try each in turn, and not think too well of either.

This contrast existed in many fields; in none was it more striking than in the method of recruiting new teachers. Young, as Head of the Department, had secured Bill with a degree from Acadia, Silverman from Missouri, Forsyth from Michigan, Mathewson from Illinois, and later Tamarkin from Russia. Haskins, commissioned by the Department to recruit a young instructor, would take the noon train to Boston, go over to Cambridge, and ask who was the best bet in this year's crop of Ph.D.'s -- native-born New England Yankees preferred. By staying over night with one of his Harvard friends, he could keep the cost, to the College, of such a trip well under ten dollars. This unimaginative, hide-bound procedure has obviously nothing to commend it except for the fact that these sallies secured for the Department Wilder, Brown, Perkins, and Robinson, who have by now contributed an aggregate of some 135 years of service to the College.

But throughout the twenties, the Department never achieved its full potential. We didn't ask enough of each other. Once you were well started at Dartmouth, promotion and a continued career were too much assumed -- and in actual fact, assured. There was some good creative work; there should have been more. We missed the stimulus of the new; and we were too well acquainted with each other. Wilder and Brown coming here in 1922, Perkins in 1927, and Robinson in 1928 were Harvard-trained New England Yankees. In an expansive moment, Haskins once admitted to me: "It was my mistake, I waved

the Crimson banner too much. I should have taken the sleeper to Chicago." But I don't think anything could have persuaded Charles Haskins to go west of Chicago, or north into Canada, or south of the Mason-Dixon line.

Admittedly, every young college teacher has to make his own adjustment among teaching, research and Committee work (and there are other things). I think we taught well, I think the urge to do creative work diminished in too many of us; but no one can say we didn't do our share of Committee work. In fact we did much more than our share. A little of it was new and invigorating planning for the future; much of it was the necessary routine; some of it (admission, counseling, discipline), really is not our job -- that is, the Faculty may lay down policies, but the administration is best left in the hands of professionals. I note one unusual assignment. Professor Haskins, as Chairman of the Joint Trustee-Faculty Committee on the new Library, did no teaching or research for two years, devoting all of his very considerable energies to this work. He did a magnificent job, and the Trustees very appropriately gave him an honorary degree. But this isn't what makes a Department strong.

The thirties found us with a seasoned group of ten veterans: Beetle, Haskins, Young, Mathewson, Forsyth, Silverman, Brown, Wilder, Perkins and Robinson. This was a rugged outfit, not brilliant, but dependable, hard-working, not without a touch of the Spartan, and inclined to be a bit intolerant of the more easy-going members of the college community. As the depression bit in, we tightened our belts, taught more and larger classes, and pared a very frugal budget to the bone. We typed our own letters, and paid our own expenses to Society meetings. Since the College had a considerable endowment for books, the Library did not suffer, and in a buyer's market, Haskins was able to keep abreast of the new, and also to round out the sets of standard journals and the collected works. There was some good creative work, but as I look back at a paper of mine published in 1935, I see that while it was an exhaustive clean-up of a minor topic, and while no one

will have to go through that laborious procedure again, still it doesn't strike sparks. Possibly this characterizes our research of the thirties -- we were working on past momentum. There were not enough new ideas, new challenges. We lost Young in 1932, and Beetle in 1937, and Haskins' health permitted only limited teaching from 1935 until his death in 1943. We took another notch in our belts, and carried on with no additions to the group.

The story of the war years is utterly fantastic, but of no particular importance in a historical sketch of this kind, except to indicate the need for a college of liberal arts to show adaptability in an emergency. Credit for the initial step goes to Prof. Haskins, who in 1940 urged us to organize large groups of Juniors and Seniors who had never elected mathematics, and give them a year course. With characteristic bluntness, Haskins said: "All these young roosters will be in the Army in a couple of years. If they have a year of college mathematics, they can get commissions. Plan out some kind of a course that they can pass, and then 'Drill, ye tarriers, drill!'" First and last we processed, with a minimum of pain, about 1000 upper-classmen who had previously exhibited a complete antipathy to mathematics. I would hesitate to say what effect, if any, this had on the outcome of the war.

With the expected arrival of 2000 members of a Naval V-12 unit, a refresher course for faculty members was organized, and in the summer of 1943, thirteen brave souls with specialties ranging from Archaeology to Zoology were named Associates in Mathematics, and assisted the seven mathematical regulars. Half a dozen temporary appointments were made to men for whom mathematics was an avocation, but who were completely competent for the job -- men varying from Benedictine monks to retired Army colonels.

I don't think the Navy mathematical program was a particularly good one, but then it was not of our making. I think the teaching was adequate, and I would venture the guess that the Associates taught with more enthusiasm than the regulars, which is fair enough -- no professor likes to have it spelled out for him, especially when emphasis is put on such a dreary subject as spherical trigonometry. This should be added -- in the College of Liberal Arts, of course greatly reduced in numbers, we maintained a complete mathematical curriculum, taught only by professionals. But every one was glad

when the emergency and the V-12 program were over.

A mathematical emergency replaced the national. Suddenly we realized that for 17 years, ever since 1928, we had made no new appointments, except on the most temporary basis. Our group was now reduced to 6, with 3 more retirements in the not too distant future; the college was expanding, and an extensive recruiting program was essential. During the next few years we did well, but on looking back we can see that we didn't do as well as we could have done.

First, our recruiting was certainly not the horse-and-buggy type which Haskins used. We went out and hunted for them. But we were too easily satisfied, when we found some one who looked promising, we took him. We didn't keep hunting until we had lined up half a dozen from whom we might select one or two.

Second, we didn't give our new members enough encouragement to plan new courses and carry out new ideas. And 6 men who have lived together and worked together for 20 years, through good times and hard times, seem to present an inevitable wall of inertia. I think we recognized this at times, I think we honestly tried to do something about it, and I don't think we were very successful.

The man primarily responsible for the change in the Department was the late Donald H. Morrison, then Dean of the Faculty. He had inherited a faculty which was extraordinarily heavy at the full professorial level. His problem — and the mathematics department comprised only a small if aggravated part of the whole — was to recruit immediately and continuously, and yet to abolish the widely prevalent opinion that a Dartmouth appointment was almost a guarantee of eventual tenure — an opinion which the past did to some extent render plausible. His success in handling this problem is today a case history in successful administration.

Dean Morrison told us what was ineffective in our recruiting, and told us what to do about it. Professor Robinson was obviously the best of the older group to do the leg-work, and he was highly successful from the start. Further, recruiting is a snowball

Process, the more you get, the more promising contacts you have.

One thing more was necessary. These new recruits must be assured that at Dartmouth there would be no conservative restraints from the old guard. It must be much more than a grudging capitulation. We must tell them that we've had our day, it's their turn now. Anything they decide they want to do, we will not merely accept, we will join in with this enthusiastically, and without reservation, to the best of our abilities. As an incidental, but an important incidental, we saw to it that no young instructor was loaded up with freshman calculus classes. Effective freshman instruction is neither necessary nor sufficient for a successful academic career. We could promise him an honors section of sophomores, and an advanced course. That kind of understanding is very effective when you are recruiting. And that is by far the best program for the full development of a young instructor, and it furnishes a sounder basis for a decision as to whether you may want to make a reappointment.

This is not the time to pass judgment on the progress made by our younger group of teachers — progress which has changed the Department from a good average outfit into an outstanding one. It would embarrass the Kemeny-Snell-Mirkil-Norman-Kurtz-Crowell-Kuller-Williamson-Kreider-Ritchie-Fraleigh group to attempt to evaluate their activities for the past few years. But as the oldest inhabitant, and as one only incidentally associated with these new trends, I can sketch out a few with almost complete objectivity. Speaking then, generally, these are the things I have liked.

A sensitive selection of important subjects of modern mathematics, incorporation of these in two outstanding books, Finite Mathematics, and Finite Mathematical Structures, and finally integration of these with the standard calculus sequences.

A unanimous and enthusiastic reception by the Department of the new 3-course, 3-term program.

Large lecture classes in Freshman and Sophomore courses, with intelligent use of graduate students in small conference groups. It seems to us of fundamental importance that we should give graduate

students a limited teaching experience, but that we should never give first or second-year graduate students full responsibility for a freshman section. This last procedure, all too common in large universities, is unfair to the graduate student, whose first business is study and research, and very unfair to the freshman who only too frequently gets a very small return for his tuition.

Honors treatment for the gifted students, lasting from matriculation to graduation. Associated with this is a program for advanced placement for students who have had some calculus in secondary school -- a very flexible program since their preparation is varied.

More coordination with the leaders in secondary schools and in graduate schools. This is particularly true with respect to the Dartmouth Schools of Engineering, Business Administration, and Medicine.

A successful beginning in a joint major, "Mathematics and Social Sciences."

The installation and effective use of a high-speed digital computer.

A succession of projects, financed by various foundations, involving cooperative work by professional mathematicians and students, both graduate and undergraduate. The partial release of our staff from teaching makes possible a wide-spread use of visiting lecturers and research instructors -- an experience from which every one profits.

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Professor Haskins was a great admirer of Riemann. Partly for the profit which others might receive, mostly for his own pleasure, he translated from the original Latin the great paper of Riemann on the flow of heat, the paper for which Riemann received the prize of the Academy of Paris. The translation is preserved in the Dartmouth Library. Fortunately, it is in English, for Haskins' German was almost as formidable as Riemann's Latin. Riemann, in

submitting his paper -- anonymously, as was the custom of the time - chose as his motto:

"ET HIS PRINCIPIIS VIA STERNITUR AD MAJORA"

This Haskins translated with discrimination:

"And by these principles the way is prepared for greater things".

When Professor Haskins equipped the room in Baker Library, in the west mezzanine, dedicated to Bezaleel Woodward, his inscription would seem to sum up the past and present - and, we hope, the future - of our Department.

The inscription reads:

THIS ROOM
CONTAINING THE SURVIVING BOOKS
OF THE
FIRST LIBRARY
OF
DARTMOUTH COLLEGE
IS EQUIPPED IN MEMORY OF
BEZALEEL WOODWARD, A.M.
A TUTOR, TREASURER, TRUSTEE
AND VICE-PRESIDENT OF THE COLLEGE
ITS
FIRST LIBRARIAN
AND ITS
FIRST PROFESSOR OF MATHEMATICS
AND
NATURAL PHILOSOPHY
"ET HIS PRINCIPIIS
VIA STERNITUR AD MAJORA"