# BEZALEEL WOODWARD

# and

# HIS SUCCESSORS

## A BRIEF ACCOUNT

## of

## MATHEMATICS

## at

## DARTMOUTH COLLEGE

## 1769-1960

By

BANCROFT H. BROWN

# INTRODUCTION

A certain amount of mental agility is required in reading this record of the slow but surprising development of a scientific department in a long-established institution. While the mathematician of 1770 could never comprehend even the simpler aspects of the mathematics of today, the mathematician of today may have some difficulty in understanding the complete complacency and satisfaction with which earlier generations regarded the standards of their times.

Always we shall meet the intolerance of the conservative, who finds virtue only in Euclid, Descartes, and Leibniz. Edna St. Vincent Millay had not yet favored us with: "Euclid alone has looked on Beauty bare", but our conservative friend would have approved. His characteristic tag was: "Quod semper, quod ubique, et quod ab omnibus" -- roughly -- "(We believe this because it has been believed) always, everywhere, and by every one." Of course "everyone" means "all right-thinking people". Intolerance, trying to oppress, has to be met with sling-shots and brass knuckles. Intolerance at home, basking by the fire, can be thoroughly enjoyable, and often serves good liquor.

Once in a while we shall see the radical: "Let's do this differently this year, just for the sake of doing it differently." A mathematical radical can be stimulating -- for a time. He is never a menace like an Attila or a Hitler; but he can be tedious.

I ask you to be generally tolerant as you meet in these pages conservatives and radicals. But tolerance is not enough; we must have understanding.

We shall see four big changes: in 1833, 1881, 1911, and 1953. These were initiated, respectively, by one Professor, by the Trustees, by the passing of the old guard, and by the administrative qualities of a Dean of the Faculty.

We shall see that, until this century, progress was a series of short steps up, with long periods of marking time, and even of retrogression. We shall see a cleanly delimited period 1833-1881 when there was no really successful instruction in mathematics, when the subject was regarded by almost every student with fear and horror, and we shall see why.

No sketch of this kind can be brought up to date; it is left to a future historian to record the exponential progress of the last decade. For varying reasons it does not seem appropriate to offer any final estimate of the services of the later departmental members who have died, retired, or are still in active service.

But a sketch such as this has little value unless the facts are backed with reasons. It is not hard to gather the facts; it is usually not hard to take a charitable and tolerant attitude. But, again, tolerance is not enough; we must have understanding.

Hanover, New Hampshire
January 1, 1964.

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. In this group were John Wheelock, Sylvanus Ripley, John Smith, and Bezaleel Woodward. All four eventually received permanent posts: John Wheelock as the second President, Sylvanus Ripley as Phillips Professor of Theology, John Smith as Professor of the Learned Languages, and Bezaleel Woodward as first Professor of Mathematics, appointed in 1782.

As would be true for many of his successors, Woodward was a man of varied talents. From the founding of the College, he was Tutor, Librarian, and general factotum; later he became Treasurer and a Trustee. For years he was local Justice of the Peace, and on two occasions ordered the college cooks to the whipping post for the theft of supplies. He was a prominent politician, a noted Surveyor, Promoter of the Dartmouth College lotteries, and "Contractor" for the construction of the first permanent college building: Dartmouth Hall. He was one of the first Masons in the Upper Valley, and the Hanover Lodge is named Bezaleel Lodge after him. (The local Masons pronounce this Be-zā'-le-el.) He took charge of the College in the interregnum following Eleazor Wheelock's death. He was also a son-in-law of Eleazor. But the obvious charge of nepotism is easily met by the equally obvious fact that Bezaleel had a mind and a will of his own. He could and did differ with Eleazar, and later with John Wheelock, the second President.

From the scanty records of the time we gather that he was a strong, vigorous, independent character -- a practical man, no dweller in an ivory tower -- but a sensible reasonable teacher of the limited mathematics then felt suitable for a college. This would comprise "advanced" arithmetic (alligation, false position, the mechanical powers, gauging), a little algebra, plane and solid geometry, the elements of trigonometry and surveying. It should be remembered that the calculus was not taught in any American College in the 18th century; at Dartmouth there is no mention of it until 1833.

The College possesses in its archives a notebook of about 25 pages, entitled

A System of plain
Trigonometry
Compiled by Beza
Woodard Math Phil Professor
Dartmouth College
June 2 1794.
Tilton Eastman's

Tilton Eastman was a member of the class of 1796. A very ornate cover has in its margins the names "Jabez B. Whitaker", and "Jabez Woodman". Whitaker was a member of the class of 1801; Woodman of the class of 1803. It is clear that Eastman copied this from Bezaleel Woodward (or from some older student), and that the book descended to Whitaker and to Woodman -- a rather interesting example of the paucity of text books at that time. The book, such as it is, shows the rule-of-thumb methods of the practical surveyor, rather than a systematic mathematical development.

There is one further word of Bezaleel Woodward. In 1788, Nicolas Pike brought out the first widely used arithmetic in the United States. Among the "Recommendations" printed in the book we find:

Dartmouth University, A.D. 1786.

At the request of Nicolas Pike, Esq. we have inspected his System of Arithmetic, which we cheerfully recommend to the public, as easy, accurate and complete. And we apprehend there is no treatise of the kind extant, from which so great utility may arise to Schools.

B. Woodward, Math. and Phil. Prof.

John Smith, Prof. of the Learned Languages.

I do most sincerely concur in the preceding recommendation.

J. Wheelock, President of the University.

It may be added that Pike, after lining up Dartmouth, succeeded in getting similar statements from the Presidents of Harvard and of Yale, and from the Governor of Massachusetts. It is difficult to imagine any twentieth century author emulating Pike.

Woodward died in 1804 after 34 years of service to Dartmouth College, and after 22 years as Professor of Mathematics. His place was taken by John Hubbard, a graduate of the class of 1785, and previously a school teacher and a Judge of Probate of Cheshire County. John Hubbard seems to have been a man of gentle disposition, and was generally liked and respected. His death, only six years later, was considered a real loss to the College.

Hubbard was followed by a distinguished figure: Ebenezer Adams, a graduate of the College in the class of 1791. He was a man of impressive physique and lusty voice. Adams had been Professor of Latin and Greek the previous year, but with the easy nonchalance of those days shifted to the mathematical chair in 1810, serving in that capacity for 23 years. The famous Dartmouth College Case occurred during this period, and Adams and Roswell Shurtleff, Phillips Professor of Theology, led the Faculty in supporting the Trustees and President Brown. It took courage to act in opposition to the New Hampshire legislature; especially when the Legislature voted that any one who continued to teach in the College was liable to a fine of $500. The case was won by the College, thanks to the oratory of Daniel Webster; but President Francis Brown had worn himself out in the struggle, and died the next year. The Trustees were not particularly fortunate in their choice of Daniel Dana as the fourth President. Dana served only one year, and was sick or absent most of the time. Adams, as Senior Professor, was President pro tempore until Bennett Tyler became President in 1822.

Adams was the author of a best-selling text: "The Scholar's Arithmetic" (1813). This was no better and no worse than the two other early arithmetics by Pike and Daboll. But there is one innovation; on page 210 Adams gives ten "Pleasant and diverting Questions". It was a new idea for America to find pleasure and diversion, even briefly, in this dreadful mathematics. There was, however, nothing original with Adams; all of these were ancient chestnuts: the frog at the bottom of the well, the Fox-Goose-Corn problem, the three jealous husbands, etc. His version of the "St. Ives Problem" (a problem which goes back to the Ahmes Papyrus of 550 B.C.) runs:

"As I was going to St. Ives,
I met seven wives,
Every wife had seven sacks,
Every sack had seven cats,
Every cat had seven kits.
Kits, cats, sacks, and wives,
How many were going to St. Ives?"

Eliminating the "man" from the usual "I met a man with seven wives", elevates the moral tone, but does not help the scansion. The school-masters of the day enjoyed seeing a little boy struggle with this, and eventually come up with something like 2,800; they enjoyed even more crushing him with the corny answer: "Only myself".

As a teacher, Adams was formal and commonplace, giving to his students little opportunity for originality or independent thought. His sense of humor seems to have attained no high development, although he was not without aspirations in that direction. Years later, Arthur Livermore of the class of 1829 wrote of him:

"He did not seek for jocose expression, but in illustrating astronomy by the aid of a broken old orrery the misbehavior of the moon drew from him the remark that she seemed somewhat lunatic.

The joke was so good, besides being his sole production, that he would never suffer the machine to be repaired, and thus he preserved the joke for each succeeding class."

Beginning in 1822, the College published a Catalogue, and we know the exact courses given; this does not constitute any material change from the earliest days. For admission a tremendous amount of Latin and Greek was required (at least on paper), but in mathematics only "Arithmetick". Throughout the four years, every student took exactly the same courses, the mathematical studies being:

| | | |
|---|---|---|
| Freshmen: | Third Term | 6. Arithmetick reviewed. |
| | | 7. Algebra. |
| Sophomores: | First Term | 9. Euclid's Elements (6 books). |
| | Second Term | 12. Plane Geometry. |
| | | 13. Mensuration of Superficies and Solids. |
| | | 14. Gauging |
| | | 15. Mensuration of Heights and Distances. |
| | | 16. Surveying. |
| | | 17. Navigation. |
| | Third Term | 9. Finished. |
| Juniors: | Second Term | 21. Conick Sections and Spherick Geometry and Trigonometry. |

This program continued with only trivial changes until Adams retired in 1833. It was the same program that Dartmouth had had since it was founded. It was essentially the program of every American College and University.

The inclusion of topics such as 14, 15, and 16 might seem to imply some practical activity outside the class-room, suited perhaps to a frontier college. This was by no means the case. You measured the distance and gauged the casks as defined in the textbook. The "surveying" and "navigation" (the latter confined to plane sailing) were trivial applications of plane trigonometry. Except for Euclid's Geometry, and the "Spherick Geometry and Trigonometry", all the material was available in Pike's Arithmetic, the second edition of which had been revised and corrected by Ebenezer Adams.

Actually there was no call to make Dartmouth graduates into practical surveyors, or sealers of weights and measures. Of the nearly 1200 men who graduated between 1770 and 1815 under Eleazar or John Wheelock, nine-tenths entered one of the professions: law, madicine, theology, or teaching.

The program makes more sense if we understand the calendar of the times:

First term: Oct. 1 to last week in December.

8 weeks vacation.

Second term: End of February to last of May.

2 weeks vacation.

Third term: Middle of June to last of Aug. (Commencement).

4 weeks vacation.

Almost every student utilized the long winter vacation to his financial advantage by teaching a district school. At that time the district schools in the spring and fall were attended only by the girls and the small fry; and were taught by women. But in winter when the big boys could be released from farm work, their presence in school demanded a "master" who was their physical superior. The school term extended from late December until "mud-time", roughly March 15. After that experience an undergraduate needed a vacation, and he needed to have his clothes overhauled by his indefatigable mother. Hence in the second term practically all students drifted back anywhere from 1 to 5 weeks late. A patch-work second term course was much more realistic than the consecutive Course 9 (Euclid) which was sensibly given in the first and third terms. Theoretically a student made up the work he had missed.

Thus to show a mastery of "Mensuration of Superficies and Solids", he would copy (from Pike) the following Definition, Rule, and Example:

Definition. A spheroid is a solid body like an egg, only both its ends are the same.

Rule: Multiply the square of the diameter of the greatest circle, by the length, and that product by ,5236, and you will have the solidity.

Example: The diameter being 20 and the length 30, to find the content. $20 \times 20 \times 30 \times ,5236 = 6283,2$ Ans.

In 1828 a new admission requirement was added: "Algebra to the end of simple equations"; later made more explicit by the statement "Davies's Bourdon's Algebra to page 94". (Charles Davies was an early American "mathematician" who found great virtue and considerable reward in editing, in English, "Davies's Legendre's Geometry", and "Davies's Bourdon's Algebra"). I may be biased, but Bourdon strikes me as superior to any strictly American text of the early 19th century. One misses, however, the high moral tone, perhaps because this was a French book. Consider this problem:

"A person goes to a tavern with a certain sum of money in his pocket, where he spends 2 shillings; he then borrows as much as he had left and going to another tavern, he there spends 2 shillings also; then borrowing again as much money as was left, he went to a third tavern, where likewise he spent 2 shillings and borrowed as much as he had left; and again spending 2 shillings at a fourth tavern, he then had nothing remaining. What had he at first?

Ans. 3s. 9d."

American currency cannot realistically be inserted in this problem, so Davies very intelligently uses British currency which in theory and in practice persisted in this country until well after 1830. But when one considers what could be done in those days with 2 shillings at a tavern, this problem must have constituted a standard challenge to the college youth of that day.

Ebenezer Adams was succeeded in 1833 by his son-in-law, Ira Young. Young was a graduate of the class of 1828, and a tutor from 1830 to 1833, at which time he became the fourth Professor of Mathematics. He served in this capacity for only five years, changing to the field of Natural Philosophy and Astronomy, where he served 20 years until his death in 1858.

Professor Young seems to have been a man of good common sense, unaffected manners, and pleasing personality. He was a sound, if not particularly inspiring teacher. He is described as social and approachable, and as exerting an excellent influence, intellectually and morally. He greatly increased the physical apparatus of the College, and he was very successful in convincing the Trustees that much more money was needed for this purpose. He was the first professor of mathematics to broaden his horizon by foreign travel. He did more than merely sight-see. He must have been impressed by what the British and continental universities were doing.

For if one examines the catalogues for 1832 and for 1833, one senses at once that the promotion of Ira Young produced a mild revolution. With trivial changes, the catalogue for 1832 is simply that of 1822, representing the mathematical disciplines which Ebenezer Adams had followed for 23 years, and the College for 62 years.

But here are the offerings of the "Mathematical and Physical Department" for 1833.

Freshman year

First term: Adams' Arithmetic reviewed
Day's Algebra commenced
Playfair's Euclid, Four books
Second term: Day's Algebra continued to twenty-first section
Third term: Playfair's Euclid finished

Sophomore year

First term: Day's Algebra finished
Day's Mathematics - Nature and use of Logarithms, Plane trigonometry and Trigonometrical Analysis, Mensuration of Superficies and Solids, and Isoperimetry.
Second Term: Bridge's Conic Sections and Curvature.
Dutton's Spherical Geometry and Trigonometry.
Bezout's Differential Calculus.
Third Term: Bezout's Integral Calculus.

Junior year

First Term: Olmsted's Natural Philosophy -- Mechanics.
Day's Mathematics -- Heights and Distances, Navigation, Surveying and Levelling.

This is the curriculum which with only trivial changes was to last until 1881, forty-eight years. Within the next few years all the Junior year subjects were pushed back into the Sophomore year. And the tradition that Sophomore year was a time of terror and horror has left its mark on Dartmouth College.

Of course it was superficial; look at that Second term of Sophomore year! Existing copies of text-books show the first 100 pages worn and annotated; but the later pages are fresh and clean and even sometimes un-cut. And remember there was never a lecture, seldom a word of explanation; you recited on what you had read, and either understood or "committed". It was a skimming, cramming program -- required of every student -- and it was universally and whole-heartedly loathed by the students. The text-books, judged even by contemporary standards, lacked the clarity and rigor of the Continental treatises. Infinitesimals, infinities, consecutive points -- all the jargon of the day -- were dished up in a very weird and repellent form.

The students protested -- vigorously, forcibly, and with full knowledge that nothing would come of their protests. But at the end of the course there was a really colorful retaliation via the famous Sophomore Burial. The Sophomores paraded with a real coffin, pallbearers, and mourners. There was an ode, and finally an oration, usually more scurrilous than humorous. The text-books were then buried with all due ceremony. In ~~1885~~ 1855 the Faculty solemnly voted to "break it up next year", and of course did nothing.

But finally, in 1874, the students scored the most sensational victory over the Faculty in the annals of Dartmouth College. The Sophomores were informed that the authorities would no longer tolerate such mockery of a funeral service as was involved in the burial of mathematics -- now a tradition of more than 30 years' standing. Whereupon the class took its cue from a passage in Sophocles' Antigone which they were then reading, "Will you bury it, a thing forbidden by the authorities? No, by Zeus, but we will BURN it."

The elaborate ceremony of cremation which followed was participated in or witnessed by every member of the undergraduate body. The Faculty, realizing that they had been taken for a ride, with commendable prudence kept out of sight.

It was certainly Ira Young who alone inaugurated this program, and spelled it out. A survey of the Faculty at that time does not indicate any one who had even studied this "new" mathematics, or could understand the implications of this program. In sophomore year anything approximating an understanding of the subject-matter must have taken a disproportionate amount of a student's time. Yet the classics professors did not object, and classicists and mathematicians united to keep out modern foreign languages, and new disciplines in the social sciences.

From what we know of Ira Young, he seems to have been a reasonable soul; and it is hard to recognize this skimming, cramming, and essentially punitive program as his. It is true he only taught it for 5 years, transferring to his first love "Natural Philosophy". I don't think for a moment he quit under fire. His successors were expected to, and did try to carry on his tradition -- with very little success. But even in a conservative age and in an ultraconservative college (which Dartmouth certainly was), it is difficult to understand how this bedlam could have continued for 48 years.

It should be added that all the available evidence goes to show that few pupils were failed for inferior performances. Suspensions and expulsions occurred, but always for breaches of discipline, not for scholastic insolvency. Academically the College operated on the principle of St. Mark: "He that shall endure unto the end, the same shall be saved."

Ira Young was succeeded in 1838 by Stephen Chase, a graduate of the class of 1832. For 13 long years Professor Chase, "Bruin" to the undergraduates, was the most detested professor Dartmouth has ever known, and that is not a light statement. Of course the program which Ira Young had installed imposed an almost impossible requirement on any teacher who tried conscientiously to carry it out, and it imposed a very heavy load on the undergraduate. Bruin, "tall, slim, sandy complexion, red hair", with his gift of exquisite sarcasm did nothing to ease this load. Years later, one of his pupils wrote: "He would sit and launch his sarcasm in cutting tones, begetting in the normal student a sense of loss of self-respect -- as if he were really the inferior being intellectually

which the Professor's talk would seem to imply. There was a refined cruelty in this that the man did not intend but that made his recitation room dreaded as a place of torture". Professor Chase died in 1851, at the age of thirty-eight.

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The historian sometimes runs into curious assemblages of facts which may or may not be related. My excuse for including this is simply that when I was teaching, the facts amused my pupils.

The student enrollment at Dartmouth College during the years of 1828-1845 is adequately indicated by these samples:-

| | |
|---|---|
| 1828 | 125 |
| 1835 | 186 |
| 1840 | 341 |
| 1841 | 331 |
| 1843 | 208 |
| 1845 | 179 . |

In this period there were no important domestic disturbances: wars, depressions, etc. The Administration of the college was largely unchanged. In 1838, Stephen Chase succeeded the very popular Ira Young as Professor of Mathematics. It was admitted by all that Professor Chase was sarcastic and tyrannical. It is a fact that mathematics was required of all students for two years, and that he taught all the mathematics courses.

Do you think this is adequate evidence that Professor Chase's reputation had become so widespread in New England that academy graduates simply refused to come to Dartmouth?

I will merely add that competent Dartmouth historians (Lord, Richardson) offer no reasons for the change in enrollment; but they consider the rise around 1840 much more inexplicable than the decline to a more normal figure in 1843.

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John S. Woodman held the mathematical chair from 1851-1855. He was then transferred to the chair in Civil Engineering in the new Chandler School, for which he was rather obviously better fitted. It may be said, in passing, that for years all the mathematics professors in the College eked out their inconsiderable salaries by teaching in the Chandler School at the fixed rate of $ 1 per hour. When this practice was discontinued years later by President Bartlett, The College professors were very resentful, and this seems to have been one of the chief causes of the split between president and faculty. We need not here concern ourselves with the inner workings of the Chandler School which was later absorbed in the College. Again, the mathematicians of a somewhat later period did some of the teaching in the Agricultural College until its withdrawl to Durham.

Woodman was succeeded briefly from 1855-1859 by James W. Patterson. There is no evidence that he was particularly well qualified for the position, or that he cared anything about mathematics. But he very much wanted to be on the faculty and this was the only post open at that time. He is described as "tall, well-proportioned, florid of complexion, his face not handsome but giving a favorable impression as he began to speak".

He was very popular with the students who considered him to be a "careful instructor, versatile in thought and courteous in manner". President Lord was very critical of his scientific ability, and reading between the lines, one guesses that his popularity with the students was due to the fact that they were not over-worked. He was transferred to the Department of Astronomy in 1859. But it was as an orator that his fame was acquired. He was later twice a member of the House of Representatives, and he served one term as United States Senator.

As far as the records show, no professor of mathematics was in residence during the year 1859-1860. It may be assumed that the instruction was divided up-without undue consideration of ability-among the unfortunate tutors of that year.

John R. Varney was Professor of Mathematics from 1860-1863. He was a graduate of the class of 1843, and had been a lawyer and teacher. His instruction at Dartmouth was considered to be unsatisfactory and he resigned.

John E. Sinclair was Assistant Professor of Mathematics at the Chandler School 1863-1866, and Chandler Professor of Mathematics 1866-1869. His position was a little anomalous. He was a member of the faculty, and did a small amount of teaching in the college, but he was not a member of the academical faculty- a distinction which at that time had both academic and social significance, but which at the present time is a little hard to make clear without a long and unprofitable digression on the peculiar relationship between the Chandler School and Dartmouth College.

In 1863 Asa Dodge Smith became President, succeeding Nathan Lord who had served since 1828. In many respects the college was in a serious position. President Lord's pro-Southern, pro-slavery views had antagonized all New England; students had gone to war to such an extent that only 31 Freshmen were enrolled, and replacements in at least six departments were imperative.

At that time the professors in a college changed their positions with an alacrity which is somewhat difficult to appreciate today. Furthermore, some positions were greatly coveted, while others were little more than/an entering berth into the academic world, a berth from which one emerged as soon as possible. At Dartmouth the prize plum was the Professorship of Intellectual and Moral Philosophy (the title varied; sometimes it was simply Intellectual, at others Moral, occasionally both). The Professorship of Astronomy was also well thought of. Just why all this was so is not too clear; but the quality(and quantity) of associated work had something to do with it. At the other end of the scale was the Chair of Mathematics; and surely those stupid requirements in Sophomore year had something to do with this.

The Mathematics post being open when President Smith took office, he offered it to the very brilliant, youthful Charles A. Young, then teaching at Western Reserve who declined. He offered it to Professor Fairbanks who taught Natural Philosophy, and he also declined; and then to Professor Patterson, provided he retired from Congress at the end of his term, and he very empahtically declined. Eventually Fairbanks was given a new post in Natural

History; Young came to Dartmouth assuming the combined posts of Natural Philosophy and Astronomy; and Patterson who wanted Astronomy or nothing, was left out, and returned to Congress, vehemently claiming that he had been sacrificed by his political enemies. Thus, despite these efforts of President Smith, there was no mathematician in 1863-1864, and we may assume that the unfortunate tutors took over again, with perhaps some help from Professor Sinclair of the Chandler School.

Finally Elihu T. Quimby, class of 1851, who had long served as instructor in secondary schools was elected to the mathematical post in 1864. As far as any records or personal recollections go, he seems to have been a completely colorless person during his 14 years of service. As early as 1872, he was associated with the U.S. Coast and Geodetic Survey, and after his resignation from his Dartmouth post he continued with this bureau until his death in 1890. His work in the Geodetic Survey was highly regarded. Apparently teaching simply wasn't his strong point.

When Professor Quimby began his work in 1864, the Trustees took a significant action. It will be remembered that ever since 1828, the requirements for admission had been Arithmetic and Algebra as far as simple equations. The Trustees now increased this to:

Arithmetic
Algebra to quadratic equations
Geometry, 2 books

This last was modified in 1869 to "Three books of Loomis's Geometry or two of Robinson's", a nice distinction then, but not one that means much today except to the antiquarian. The important thing to note is that then, as now, the Trustees insisted on their right (quite independent of what the faculty might think) to set the admission requirements.

Charles F. Emerson, 1868, taught mathematics in the years following his graduation, combining the duties of tutor with those of Instructor in Gymnastics. Appointed Associate Professor of Natural Philosophy in 1872, he continued to teach mathematics until 1878 after which he devoted himself to physics. In 1893 he became the first Dean of the college.

The reader is again reminded that the Sophomore requirements in mathematics are still in effect, and that burials (or cremations) are still the order of the day. The college has celebrated its centennial (in 1869, 100 years after the signing of the Charter on December 13, 1769). The mathematical department,-although quite unaware of it-is about to leave the state of ancient history, and enter mediaeval history.

Three men now appear on the scene:

| | Service | Length of service |
|---|---|---|
| Frank Asbury Sherman | 1871-1911 | 40 years |
| Arthur Sherburne Hardy | 1873-1893 | 20 years |
| Thomas Wilson Dorr Worthen | 1874-1911 | 37 years |

Frank Sherman was a veteran of the Civil War in which he lost an arm. Graduating from Dartmouth in 1870, he first taught the very limited mathematics of the Chandler School, eventually shifting to the College. He was competent in the sense that he could listen to and judge the value of a recitation.

Professor Hardy was a suave, polished man of the world; a successful author of romantic novels, witty and cultured. It is limited praise to say that he was the best mathematician of the three. His Ph.D. (from Amherst) was honorary as indeed were practically all the advanced degrees of that time.

Thomas Worthen, always known as "Tute", was an incredibly active, vigorous man, a marvel of physical development, exuberant, and enthusiastic. He had far too many outside interests to devote much time to mathematics, and it was 19 years before he was promoted to a professorship.

Even when we consider the modest demands made by the colleges of the 1870's for mathematical talent, no one of these three would bring any high academic esteem to Dartmouth. It is true that Professor Hardy had written a text on quaternions; and to the more naive this might have seemed to be a great product of erudition.

The first event of interest to us is the great revision of the curriculum, a revision which was urged on the faculty by the Trustees. The details were worked out by the faculty, not without considerable bickering, sent to the Trustees for their approval, sent back to the faculty for further consideration, and finally approved by the Trustees in October, 1881.

This "new" curriculum may for mathematical purposes be summarized as follows:-

| | | |
|---|---|---|
| | | REQUIRED |
| Freshman | first term: | Algebra |
| | second term: | Geometry |
| | third term: | Plane and spherical trigonometry |
| | | REQUIRED |
| | | (but with alternatives) |
| Sophomore | first term: | Analytic Geometry; or Classics |
| | second term: | Calculus; or Mechanics and French |
| | third term: | Calculus; or Mechanics and French |
| | | ELECTIVE |
| Junior | first term: | Least squares |
| | second term: | Determinants |
| Senior | first term: | Quaternions |

The choice in the "Alternatives" varied from year to year. The details are not important; but the principle of choice had been established. The conservative members of the faculty described this as the "entering wedge", which of course is exactly what it was. The work absolutely required in the classics and mathematics was diminished, the variety of subjects offered was increased, but the general principle that every student must have a smattering of nearly every subject was preserved. From the mathematical view point, the important thing was that the hated cram-course, required of all sophomores could now be avoided; and those who continued with mathematics got a better sequence of courses. Naturally the Sophomore burials became a thing of the past, although alumni protested with vigor this failing of the old traditions.

The entrance requirements were theoretically increased to:
Arithmetic, including the Metric system,
Algebra to quadratics,
Plane geometry.
Again, these should not be taken too seriously.

The mathematician of today notes the new optional course in "Quaternions" with mixed feelings. Naturally the course was advertised because Professor Hardy had written a book on the subject. The students of that time were probably proud and pleased to see such an abstruse subject in the catalogue-provided they did not have to take it. The course proved that Dartmouth was in the van, a leader in the newest developments of the day! Even after Professor Hardy resigned in 1893, Frankie Sherman and Tute Worthen, for sentimental reasons continued to offer Quaternions, and sometimes even taught it. In 1911 when they passed on the torch to other hands, quaternions died a very speedy death.

With the "Sophomore Hurdle" thus eliminated, the teaching of mathematics at Dartmouth might have been a slightly monotonous, but very pleasant and easy way to make a comfortable living, if there had not broken out a terrific fight between the President and a large majority of the faculty. It seems hardly necessary to set out the details of this Civil War, and L.B. Richardson in his "History of Dartmouth College" outdoes himself in his description of that classical carnage. For more than ten years the struggle continued with the President, six Trustees, about seven faculty members, and most of the undergraduates arrayed against four Trustees, sixteen faculty members, and nearly all the alumni. It was alternately a cold war and a shooting war. The three mathematicians were vigorously opposed to the President, especially Professor Hardy who wanted very much to be President himself.

Eventually, in 1892, President Bartlett resigned, bloody but unbowed. The accession of President Tucker brought welcome relief. Professor Hardy-disappointed that he had been overlooked-resigned to enter the State Department where he had a distinguished career, being United States Ambassador successively to Turkey, Greece, Switzerland, and Spain.

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 Congragational ministers. It was a college which, as we have said, had for years been torn by wrangles between President, Trustees, Faculty, 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 distingushed 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.

Everyone 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. Professors Sherman and Worthen, with help from Professor Hardy and from an occasional tutor, had constituted the department since the early 1870's, and would continue until 1911, actually after Dr. Tucker had retired.

In mathematics, the elementary courses remained much the same, but the advanced courses, at least on paper, would seem to be quite respectable. Thus the offerings for 1898 were:-

| | | |
|---|---|---|
| 9 | Theory of Error and Least Squares (Johnson) | Worthen |
| 10 | Analytic Mechanics (Williamson and Tarlton) | Poor |
| 11 | Solution of Transcendental and Higher Algebraic Equations (Merriman) | Sherman |
| 12 | Determinants (Weld) | Sherman |
| 13 | Hyperbolic Functions (McMahon) | Worthen |
| 14 | Differential Equations (Murray) | Worthen |
| 15 | Quaternions (Hardy) | Worthen |
| 16 | Projective Geometry (Reye) | Sherman |
| 17 | Theory of Functions (Durège) | Worthen |
| 18 | Elliptic Functions (Baker) | Sherman |

On paper, a fairly respectable offering. But the inclusion of the text to be used, hints at a charge that unfortunately is only too true. Dartmouth was then, and for many years to come, a textbook-ridden college. A class meeting was literally a recitation, you recited 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, and there was very little in the way of explanation. In class, the instructor had a signal advantage; he could keep his book open. Further, unless one has critically examined such a text as Durège's "Theory of Functions", one can have little idea how bad it was, how it missed the forest for the trees, unless interpreted and supplemented by a teacher with insight and vision - qualities which were not inherent in Frankie Sherman and Tute Worthen. There was no mathematical library at all. The concept of mathematical research had simply never occurred to any one on Hanover Plain.

Year after year, these two worthies jogged on in their peaceful careers. They were now men of standing in the community. Tutor Worthen's first position had been "Tutor in Latin and Greek and instructor in physical education". The latter was his first love; his reputed gymnastic feats seem incredible; and his method

of surmounting the high fences which then lined the campus brought on him the official disapproval of Presidents Smith and Bartlett - but with no diminution of his activities. The college now had two endowed chairs in mathematics: The B.P. Cheney Professorship in Mathematics, and the Professor of Mathematics on the Chandler Foundation. Worthen held the former of these, Sherman the latter. If Sherman lacked color, Worthen did not. For many years Tute was Judge of the Municipal Court, where he administered justice tempered with mercy, and not without humor. He cultivated the largest vegetable garden within the village limits. He was responsible for the creation of Occom Pond. He directed a very successful summer session. And he taught with gusto and vigor - but with complete lack of rigor.

For brief periods (one to four years), tutors or assistants carried some of the elementary work. These include Messrs. Hastings, Cook, J. H. Proctor, Poor, Bacon, Holden, Mitchell, Barton, Lewis, Moore, C.A. Proctor, and Beetle. Of these, four should be mantioned briefly.

Professor Poor transferred to Astronomy in 1900, and was a legendary and greatly beloved member of the faculty until his death in 1934.

Professor Holden transferred to the Thayer School of which he was Director for many years. He later returned to the D partment of Mathematics which he served, not without embarrassments, from 1925-1934.

Professor C. A. Proctor transferred to the Department of Physics, where he gave distinguished service to the College until his retirement.

Mr. Beetle was made an "assistant instructor" in 1907, one year after his graduation from Dartmouth. He left to secure his doctor's degree at Princeton, and returned to Dartmouth in 1914. He belongs more properly to a later generation, and an account of his long and valued service to the College will be given later.

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 a fellowship at Harvard where his graduate career was brilliant. He had pursued postdoctoral studies abroad. He had had considerable teaching experience. He was the first mathematician at Dartmouth with an earned Ph.D., and with a real interest in research. It looked like an excellent appointment.

The catalogue for 1909-10 is revealing. After the elementary courses, we find:-

| | | |
|---|---|---|
| 9 | Differential Equations | Haskins |
| 10 | Determinants | Sherman |
| 11 | Quaternions | Sherman |
| 12 | Elliptic Functions | Sherman |
| 13 | Theory of Equations | Sherman |
| 14 | Fourier's Series | Haskins |
| 15 | Theory of Functions (Comp.Var.) | Worthen |
| 16 | Linear Differential Equations | Haskins |
| 17 | Introduction to Higher Algebra | Haskins |
| 18 | Determinants | Sherman |
| 19 | Theory of Functions of a Real Variable | Worthen |

A mathematician instinctively feels that the courses given by Haskins represent a great advance over the stereotyped determinants and quaternions of an older generation. But unless you have actually seen the texts and witnessed the methods of instruction, you can have no idea how puerile courses in complex variable and real variable can be made.

This, then, is the time to introduce to the reader Professor Charles Nelson Haskins, as surprising a representative of the culture of the early twentieth century as can well be imagined. The author of this sketch is perhaps as well qualified to describe this man as anyone. I knew him well for 20 years, and at his death, I took charge of the disposition of his massive collection of mathematical notes.

Charles N. Haskins was born in New Bedford, Mass., the son of a cabinet-maker. Throughout his life he was an excellent carpenter, and his collection of edged tools grew to fantastic proportions. More generally, 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 was an incredibly serious and methodical student from his early teens. Every one of the twenty year-courses which he took in high school had a note-book with assignments, class discussions, copies of all written work handed in, and summaries. These note-books, preserved to his death, showed a ferocious approach to the job of getting an education. When he entered M.I.T., all his notes were preserved on uniform 8 1/2 x 11 paper with 7-ring note-book bindings, a practice which he consistently followed throughout life.

His training at M.I.T. and later at Harvard was purely scientific. Yet he balanced that with an unbelievable acquisition of ancient and modern languages. Latin and Greek he mastered, and then French, Spanish, Italian, and Portuguese. But-and here the Harvard influence is obvious- he made German a second mother tongue.

He spoke in it, he thought in it, he annotated his books in it, and he quoted Goethe's Faust in season and out of season to bewildered classes (and colleagues) who blinked an uneasy, and usually fake, acquiescence. In his later years he decided that the Scandinavian work in statistics should be read in the original. He therefore mastered Danish, Norwegian, Swedish, and Icelandic by a method which was rather delightful. He studied a vocabulary, learned the grammar, and then read a book on arctic exploration for which he had an English "trot".

Inevitably, he was an uncompromising Republican. He never forgave Theodore Roosevelt for bolting the party in 1912. I once asked him with perhaps unreasonable facetiousness what he thought of Franklin D. Roosevelt, and his reply was, "One Roosevelt in one geologic era, is one Roosevelt too many". One day he pointed out with high glee the following quotation from the Old Farmer's Almanac:

December 28. HOLY INNOCENTS. Woodrow Wilson born.

He was a good citizen, attending town meeting faithfully, and representing the interests of the small village of Etna where he lived. His charities were local, and completely anonymous. A good few little Etna boys and girls who used to walk on crutches, are now restored to full health; and never knew how it happened. A very considerable donation was made to the college to install the room in Baker Library, dedicated to Bezaleel Woodward, and equipped largely by Mrs. Haskins with authentic furnishings of the 1770's.

Professor Haskins lived three miles out of town, and drove (not very well) a lively mare which he referred to as " that damned hay-burner". The hay-burner was replaced in 1924 by a car which he drove slowly and with maximum concentration. He never indulged in any recreation, never went to church, movies, lectures, or entertainments.

Practically all his time was devoted to study and research- and his neighbors have told me that the light in his study often burned until 4 or 5 a.m. Everything he did, he did the hard way. "I am a complicated man, I live in a complicated house, and I have to do things in a complicated way". He was by no means lacking in a sense of humor, and even enjoyed shocking some of the more squeamish members of the faculty with racy stories. It was from him that I first heard that New Bedford classic "Thar she blows". He told me with glee that whenever he visited the office of Dean Craven Laycock, the dean's secretary, a very prim lady, would close the door between her room and the dean's with firmness. His "vacations", always alone, were spent on Cuttyhunk Island; and of course he worked every minute not spent in eating and sleeping.

When he had decided on a textbook for use, he had all the problems in the book photostatted; he cut them up, and pasted the problems on separate sheets of 8 1/2 x 11 paper. He then did all the problems, entering the data in red ink, the details in black ink,

and the answer in green. Sets of ink bottles were available on his office desk, home desk, drawing table, and beside his bed.

His early research was first-rate. In later years he read extensively, and did not publish unless he thought it was of top calibre. Especially he had read widely and with discrimination in the collected works of the masters: Euler, Gauss, Laplace, Legendre. The mathematical library at Dartmouth was almost non-existent in 1909, and the really excellent collection which I first saw in 1922 was a monument to his uncanny purchasing ability.

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 handwriting 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 occured to him that students peversely 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 nicknames for the faculty were standard. They were not always complimentary, but they were pertinent. Inevitably, he became "Hippo" Haskins.

Such a man, precipitated, in 1909, into the calm life of Hanover Plain, would in any event have produced some measure of conflict. To his genial but aging mathematical colleagues, who had probably never heard of an epsilon-delta proof, he must have been a severe trial. The new President must have approved of his abilities, though he could not long have been unaware of his shortcomings.

Two years passed, and Professors Sherman and Worthen retired. In 1911, the Head of the 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 such powers. 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 very few first class American productions of the early twentieth century. His "Fundamental Concepts of Algebra and Geometry" was a pioneering effort, it had an extraordinary appeal to both the secondary and college fields-fifty years later it is still surprisingly good reading. He was no narrow scientist; in fact he always insisted that mathematics was not a science, but one of the fine arts. He immediately established himself as one of the outstanding members of the faculty. He was generally known as "Cy" Young (in memory of the old-time pitcher of the Boston baseball team). Cy was affable, rather quiet,

unusually objective.

His appointments did involve a good deal of turn-over. Names such as Pitcher, Gaba, Dines, Rowe, Allen, Norwood, Brahana, Fraleigh, and Tanch flit briefly across the scene. But the appointments of

| | |
|---|---|
| Bill | in 1912 |
| Morgan | in 1912 |
| Beetle (returning) | in 1914 |
| Mathewson | in 1914 |
| Forsyth | in 1916 |
| Silverman | in 1918 |

have been of significance to Dartmouth and Hanover.

The Catalogue for 1911 shows how well Professor Young had made the change from the mediocrity of the earlier years: (After the usual elementary courses)

| | | |
|---|---|---|
| 9 | Differential Equations | Haskins |
| 9a | Introduction to Modern Geometry | Young |
| 11 | Analytic Geometry of 3 Dim. | Pitcher |
| 12 | Vector Analysis | Haskins |
| 13-14 | Projective Geometry | Young |
| 15-16 | Advanced Calculus | Pitcher |
| 17-18 | Theory of Fncs. of a Com. Var. | Young |
| 19 | Introduction to Higher Algebra | Haskins |
| 20 | Fourier Series | Haskins |
| 21-22 | Real Variable | Pitcher |
| 23-24 | Thesis and Research: | Young, Haskins, Pitcher. |

Much the same pattern occurs until 1917. There is clever utilization of the varying abilities of the staff. And of course there is no comparison between the type of instruction in 1911 and that of 1908. The modern history of the Department has begun.

By 1917, the Department was fairly well stabilized with at least 6 men who would become permanent fixtures. In that year, Professors Young and Morgan wrote a book "Elementary Mathematical Analysis", and Professor Young as Head of the Department decided that all Freshmen at Dartmouth should use this book-and then there was a row.

The book itself was one of the earliest attempts in this country to "integrate" the disparate subjects of Algebra, Trigonometry, and Analytic Geometry by one unifying principle: the function concept. A modern mathematician would probably think this book dull, old-fashioned, and tedious. It is painfully complete; the authors did not dare to leave out any of the topics of the traditional courses. My personal view (I never taught the book), but I have read it, is that the "integration" is very superficial; in fact I am not at all sure that the function concept could, in any real sense, unify these subjects.

The book is very wordy. It motivates, compares, and contrasts-in fact talks a great deal. One gets the impression, perhaps unfairly, that the authors are trying to tell the instructor how to teach. Professor Young thought all this was very good; Haskins thought it was very, very bad.

The Department split into three groups:-

I Young and Morgan who had faith in the book.
II Haskins and Beetle who had no faith at all.
III Bill, Mathewson, Dines, and Forsyth, who didn't have much faith, but were willing to try it as an experiment.

But World War I had now engulfed the United States, and the Catalogue for 1918 grimly recognizes that Dartmouth had gone to war. This is the entire mathematical offering:-

1-2 Elementary Mathematical Analysis.
3-4 The same, for students presenting Trigonometry.
5-6 The Calculus.
5a Elementary Principles of Artillery Fire.
11 Exterior Ballistics.
12 Fourier's Series and Allied Topics.
14 Determinants.
22 Mathematical Theory of Statistics, Finance, and Insurance.

(The discriminating reader may wonder whether the inclusion of course 14 means that Tute Worthen has returned to help out in the emergency. It is a logical idea, but not true.) Professor Haskins was called to Aberdeen Proving Grounds; and Professor Bill became Director of the Canadian Selective Service Act. On his return, Gordon Bill became engrossed in administrative work, and although retaining a nominal position in the department, ceased to function in an effective way.

At the close of the war, two important changes were made. First, the faculty voted that mathematics should no longer be required for the A.B. degree; although the requirement was kept for the B.S. degree. (Eight years later, when the A.B. was made the only degree, the requirement ceased entirely.) Second, the Trustees, undoubtedly inspired by the able young President Ernest Martin Hopkins, abolished the old office of Head of Department, substituting the policy of a rotating Chairmanship, the Chairman being appointed by the President and having exceedingly limited powers as compared to those of the old Head. It is worth mentioning that Professor Young actively favored this democratic change-an example of magnanimity which most decidedly was not shared by most of the other department heads of that time.

The first Chairman was Ralph Beetle. He had joined the Department in 1907 and served 5 years. He resigned, went to Princeton, secured his doctorate in two years, and was called back to Dartmouth in 1914. He was promoted to Assistant Professor in 1915,

and to Professor in 1921 at the expiration of his Chairmanship.

Ralph Beetle was an extremely able man, logical and clear-minded. Until his untimely death in 1937, he served the College and community with distinction. He was Judge of the Municipal Court, and Moderator of the Hanover Precinct. Vigorous and forthright, he took determined stands on academic and political issues.

Professor Beetle sensed clearly the role that a Chairman should play. He set a pattern that has stood the test of time-a pattern which consciously affected all who knew him. While other departments submitted to petty autocracy-or lapsed into a complete inertia-the record of the Mathematics Department shows a true democracy, eager to advance the best interests of the whole; yet guarding with care the personal independence and integrity of each individual. We can be proud of the record. Of course we have made mistakes; certainly we should not hesitate to change and discard; but we have a goodly heritage. And we owe a great deal to the wisdom of Ralph Denison Beetle.

Even with the majority of the Department opposed to the Young-Morgan Freshman text, it was given a fair chance after the war, and continued as a requirement until 1920. Formal work in elementary Algebra, or "College" Algebra to use the current but misleading phrase, was now abandoned, for the first time in the history of the College. Freshmen began with a brief course in Trigonometry (if not already studied) and Analytic Geometry, with the Calculus gradually creeping in, eventually to become 50 percent of the year course.

New courses in Finance, Insurance, and Statistics were introduced and proved popular to an almost embarrassing extent, this last being in part due to the fact that they could be used to work off a heavy and somewhat illogical science requirement.

Professor Haskins served as Chairman from 1921-23, Professor Young from 1923-25, and Professor Haskins again from 1925-27.

Various appointments of a temporary nature include Messrs. Shaub, Loring, LaPaz, and Hedlund; Doctors Reynolds, Langer and Teeter, and Professor Tamarkin, Dr. Spooner, and Professor Holden fill out the score-the last two not without certain complications and embarrassments.

Recruiting on a more permanent basis was undertaken largely by Haskins. Nothing could be more striking than the difference in the methods employed by Young and Haskins. Young had secured Bill with degrees from Acadia and Yale, 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 overnight with one of his Harvard friends, he could keep the cost to the college for such a trip well under ten dollars. These sallies produced Wilder and Brown in 1922, Perkins in 1927, and Robinson in 1928. Obviously the addition of four Harvard-trained New England Yankees doesn't make for a well-balanced Department. Young would at times mildly demur, suggest that we should go farther afield. He suggested the Central States, the West, Canada, and he noted that extremely competent mathematicians were coming to this country from Europe. Haskins would growl: "Better the devil you know than the Devil you don't know". Haskins' unimaginative, horse-and-buggy procedure had obviously nothing to commend it except for the fact that his efforts secured for the Department, Wilder, Brown, Perkins, and Robinson, who have contributed an aggregate of some 140 years of service to Dartmouth College.

I now give, undoubtedly in too much detail, an account of the development of the policies of the Department and the evolution of Departmental Regulations-and even regimentation-in the years 1921-27 under the Haskins-Young-Haskins regimes. Those who lived through those slightly hectic days must recall them with some vividness. But the account should be put down (even though the author may be biased), so that all may see the evolution of a Department where strong men clash--not so much for mastery-- as for the advancement of what seemed to them desirable. (The author can now speak from personal observation, and not depend on histories, and oral accounts.)

In 1922-23 the Freshmen courses were :-

1-2 Trigonometry; Plane Analytic Geometry.

3-4 Plane and solid Analytic Geometry (for those presenting trigonometry).

These courses might be described as the culmination of the hopes of Chairman Haskins for a decent, respectable, God-fearing Freshman program. Greatly then to his annoyance, Professor Young as Chairman of the Departmental Committee on Educational Policy (Young, Beetle, Silverman) brought in a majority report (Young, Silverman; Beetle dissenting) to shelve these courses in favor of Griffin's Mathematical Analysis, a "unified" course which was decidedly more radical than the Young-Morgan text. And the debate was on.

Young praised the broad, cultural value of this advanced, up-to-the-minute book. He particularly liked the way the calculus was brought in early, to strengthen the unifying principle of the function-concept.

Haskins called the High Heavens to bear witness that we had gone through all this before, and why should we return to the chains that once bound us!

Silverman felt that mathematicians were too much inclined to stress the disciplinary and even punitive features of their subject, and that this book had definite promise in the other direction.

Beetle in a devastating attack on a book which included problems in chemistry, physics, psychology, economics, physiology, and sociology, wondered who in the department was competent to discuss these varied subjects--and why should he want to?

And every one else had his say.

The text was adopted; worked well for about 4 weeks; and then got progressively worse and worse. Griffin, like Young and Morgan, couldn't (or didn't dare) leave anything out; and the whole motley array of trigonometry, algebra, analytic geometry, and the calculus appear, but in an irritating order. Haskins' comment was; "Griffin didn't clean his cow before he milked her, and a good deal of extraneous matter got in the pail. After he milked her, he skimmed off what little cream there was, and served that first. The rest he watered until it was blue, and then it turned sour."

Next we tried Woods and Bailey which combined analytic geometry and the calculus in a way which the technological schools may have found practical -- but we did not. So we went back to a very little trigonometry, followed by a fair amount of analytic geometry; but Silverman and Brown demanded and got a concession. There should be -- not unified, but squarely as an independent unit -- a considerable amount of the calculus in the Freshman year. No text seemed suitable for this; and thus began the long regime of our own mimeographed texts, designed for a special purpose, and for a specific length of time.

A smart aleck way of putting it would be to say that a cat-and-dog fight developed between Professors Haskins and Young. It could be argued that both of these men to some extent overstepped the authority of a Chairman; a thing that Beetle had been very careful not to do. But it is not quite as easy as that. After all, the Chairman is, during his term of office, to a considerable extent, a leader. If he thinks a course of action is advisable, it is his duty to advocate it. He is, at times, in possession of the confidential views of high administrative officers; and he is expected to use, but never abuse, his privilege. And one more thing. I recall a statement of Alexander Meiklejohn-- a man whose policies I never admired, but sometimes you can learn from the Devil-- to the effect "A new administrator can always get the first thing he asks for from his Board of Trustees!" And so it was with the Department. A new Chairman, burning with zeal for a pet project, can almost always put it over.

Now the simple fact is that up until about 1948, much of the heritage, much of the unwritten law, and all the rules and regulations of the Department dated from the Haskins-Young-Haskins regimes of 1921-1927. They were strenuous years to live through; they grayed the hair of not a few of us; although looking back I wouldn't have missed them for a good deal.

Thus Haskins felt that a competent instructor could handle 24 or even 28 men in a section; Young said "No, twenty is the absolute limit, twelve or fourteen is better." So Haskins installed extra seats in the rooms of old Chandler Hall; Young took them out; and Haskins put them in again.

In the first semester of 1924-25, four students elected the course Math. 15-16, a four-hour course which covered the ground of three calculus courses. Young, as Chairman, promptly split this group of four students into two sections; he took one and Professor Langer took the other. That kind of administration uses up man power pretty fast; it isn't too good for the students either.

The absentmindedness of Young partook of the amusing and the exasperating. One day he locked his office at noon, forgetting competely that there was a general hour examination for all the Freshmen that afternoon, and that the papers were in his office. Since I was then the thinnest man in the outfit, the old gymnastic traditions of Professor Worthen were utilized in boosting me through the transom. When Beetle heard of this he decided the younger generation were now old enough so that they could be trusted with a secret. We all had keys which mastered the outside doors and our own offices, but nothing else. Beetle produced his key, and a file; and proceeded to file our keys down so they would master everything in the building. Beetle then told us that he had obtained the pattern from Professor Gaba in 1911. Gaba had studied the keys, and finally produced one that would cover Chandler Hall. Continuing his researches, he eventually produced a masterpiece which would open any door in the College. He unwisely boasted of this, and President Nichols formally requested that he turn in this key, and limit his activities in the future.

Unusual circumstances would occasionally develop; a rule would be made; and remain on the books even after it had lost its real significance. Thus, in the first semester of 1922-23, there were 8 sections in the course on the Mathematics of Finance, of which

| | | |
|---|---|---|
| Forsyth | had | 2 sections |
| Beetle | | 3 |
| Haskins | | 3 |

Whereupon the Committee on Educational Policy noted that the major portion of the time of three of the older members of the Department was devoted to this course, and that it was not desirable that this should continue indefinitely. Therefore they recommended that any member of the Department might be called upon to teach this course; and this recommendation, duly adopted, was a departmental vote still in force 25 years later. Somewhere around 1930, Haskins seriously suggested that it was Young's duty to teach a section of this course. Young protested mildly (it was a pretty dull course); whereupon Haskins dredged out this "Rule" from the archives, and

triumphantly pointed out that Young had been Chairman of the Committee that had recommended this rule. Young didn't teach the section.

Professor Young felt strongly that students should be segregated by ability, and proposed that Type I, Type II, and Type III sections should be organized, immediately after the first common hour examination. The Department did not like this ( and in fact it turned out badly), but this proposal was made by Young when it was first known that he would be Chairman next year; and since this was his first project, we agreed to give it a try. But in order to make the plan, as he thought, effective, Professor Young insisted (with the terrific insistence of an ordinarily mild man) that although transfers might and should be made freely during the semester, nevertheless at the end of the term, no one could get an A unless he were in Type I section, and a member of Type III could not get more than a C. The Department strenuously objected to this shuttling back and forth, and particularly to this arbitrary grading, but somehow Young talked over a slim majority. And of course at the end of the semester we were in trouble. A few students in the lowest group, smitten with late remorse for their negligence and evil ways, proceeded to do some real studying, and suceeded in getting 100 percent on the final. And a few Type I men, coasting on their laurels achieved grades around 35 percent. As I recall it, we finally effected a compromise which satisfied no one (including the students). Now I strongly favor Honors Groups selected by some reasonable criterion, and receiving essentially different treatment. But from this experience, I would never want to see a student in a dumb-bell section told in advance he could not get more than a C.

Reminiscing farther, when I came to Dartmouth in 1922, a student's "G" grade was effected by the formula:-

let H = average of hour examinations (often only one)
F = final examination grade
E = instructor's personal estimate of student

then $$G = \frac{H + F + 2E}{4}.$$

When the late Dr. Spooner produced cases for which

H = 40
F = 20
E = 70

G = 50;

and proposed to pass the man with a D, we felt that something was wrong; and the system was soon modified.

The year 1925 was the year that showed the birth of many of the practices that came to be considered good, and which became standard procedure. Some of them are clearly recognizable in the the 196o's..

These practices included all the departmental records, the methods of handling homework, forms, and general procedures. Professor Haskins had again assumed the Chairmanship; Young was in Europe on sabbatical leave for the entire year; and Haskins with straightforward realism, saw that he had the chance of a life-time to persuade the Department that his ideas were the good, true, and beautiful.

His technique consisted in getting an unusually large departmental budget; spending the whole summer in getting his system of forms, records, and instructions in shape; and greeting us in September with the whole system as if it were a fait accompli. The Department was probably not as vigilant as it should have been in insisting on democratic control; but the forms were all printed and paid for; and the members of the Department were hardly of the type who would throw away hundreds of dollars for a principle. Actually many of the forms were good, and some of them were of a type that a few of us had advocated for years. Some of his more punitive ideas were supressed, or plain ignored. Perhaps this unorthodox procedure did more good than harm, for it did awaken in some of us the recognition that a certain amount of vigilance has to be maintained in any democracy.

Also in 1925, the College adopted after a series of meetings, and long debate, the "New" curriculum, essentially advocated by L.B. Richardson, and set forth in his book: "A Study of the Liberal College". A strong feature of this curriculum was the great increase in the requirements for the major-together with the comprehensive examination. There was a corresponding diminution in the requirements for the first two years.

Haskins met this challenge with devices which seemed perfectly just and righteous to him-but let the reader be the judge. He first wrote to the President to the effect that it had been customary in the Mathematics Department for the Chairman not to be a member of the Committee on Educational Policy; but with the new curriculum coming up he felt that this would be a mistake this year; and President Hopkins wrote Professor Haskins that he, the President, hoped very much that Professor Haskins would be a member of the committee. Haskins then packed the committee: Haskins (Chairman), Beetle, Brown. "Packing" does not by any means imply that Beetle and Brown would be subservient to his every wish. It does mean that in his observation, he thought that Beetle's and Brown's ways of thinking were nearer his than were those of the other members. (There is no speculation about all this. I saw the correspondence; and Haskins told me what he had done and why. I think he was badly fooled in thinking that Beetle and I were most apt to stay with him all the way. I have never stated the facts before. I can't see how they could do any harm now.)

In committee, Haskins' first proposal called for the following requirements for a mathematics major:-

| | |
|---|---|
| Freshman year | Math. 1-2 or 3-4 Trig., anal. geom., calculus<br>Physics 1-2 or 3-4 |
| Sophomore year | Math. 11-12 Calculus<br>Physics 11-12 or 13-14 |
| Junior year | Math. 13-14 Advanced calculus<br>Math. 19-20 Advanced algebra<br>and one advanced course in physics |
| Senior year | Math. 101-102 Coordinating course<br>Math. 55-56 Complex Variable<br>Math. 59-60 Diff. Equations of Math. physics |

Plus a reading knowledge of Latin, French, and German.

Haskins in all seriousness considered this a modest proposal eminently suited to a college of liberal arts. To the argument that unless a Freshman elected physics in his Freshman year, he could never major in mathematics, Haskins responded with the crushing argument "Why should he?" To doubts as to the language requirement it was pointed out that Gauss and Euler wrote in Latin; Lagrange and Laplace in French; and everything on Complex Variable was in German, including Osgood's Funktionentheorie. To the argument that this was a much more severe course than was pursued at Harvard, Yale, or Princeton, Haskins went to some pains to point out that it should be a source of pride to Dartmouth that she had not yielded to the enervating influence of the wizards of Columbia Teachers' College.

But the Beetle-Brown opposition had a fairly tough strain in it; one session that I recall ran until 4 a.m.; and the final compromise ran like this :-

(1) omit all language requirements,

(2) reduce the physics to one year taken in either Freshman or Sophomore year,

(3) in Senior year, give a choice between Complex Variable and Higher Geometry; and make the third course elective.

This report was brought to the department which immediately threw out all physics prerequisites; gave more freedom in Junior and Senior years; and the resulting product remained essentially in effect until after 1950.

Professor Haskins, completely upset by the loss of all of his beloved physics prerequisites, announced that under no circumstances would he present such an emasculated program to the College

Committee on Educational Policy. The Department said it was sorry he felt that way, but this was their decision, and to whom did he wish to assign the duty of making the report? This marked the end of Haskins' attempts to force the unregenerate department into his own mold. Actually his influence --which had been very considerable-- was practically at an end.

There followed for him two years in which he did no teaching, but devoted all of his very substantial abilities to the College as Chairman of the joint Faculty-Trustee Committee on the Building of Baker Library. This was the happiest period of his life; and in recognition of his work the College very properly gave him an honorary Doctor of Science.

Soon thereafter he contracted cancer of the throat, and conquered it. But from that time to his death, it became a perennial problem for each Chairman to decide what courses or what program could be assigned to him in which his formidable abilities could be utilized to the best advantage of his students.

In the twenties and early thirties, the department was considerably handicapped by the presence of instructors who, though well-intentioned, were not professional mathematicians. Dr. Spooner, ousted from the Presidency of Norwich University in an unusually raw manner, was engaged in 1921. World War I had completely stopped the flow of doctors from the graduate schools; and Colleges took anyone they could get. He was a kindly gentleman of the old school, totally lacking in the suspicious nature which his colleagues all possessed, some to a remarkable degree, and I am afraid that his students put a great deal over on him. But it must be admitted that his patience and long-suffering with sections of repeaters (and the curriculum of those days kept some students repeating Math. 1-2 to the end of their Senior year) made him too valuable a man to discard lightly because of doubts as to his academic standards in regular sections. College administrative officers and faculty members have also a peculiar sympathy for an elderly man who has given his life to education, and who is desperately up against it financially. In all he taught here for eleven years, being retained several years after his seventieth birthday.

A different case was that of Professor Holden, who had taught mathematics briefly at the turn of the century; had become Director of the Thayer School of Engineering, and who was definitely wished on the department by President Hopkins at the time when his services with that school were terminated. This was a mistake, and President Hopkins has admitted that it was. And yet, one can see how the President felt; here is a man who has given 25 years of devoted service to the College. He just isn't up to the job of Director of the Thayer School. The College owes him some consideration; he can't very well take a minor post in the Thayer School; he has taught mathematics; can't he do that again? Obviously the trouble was that mathematics had advanced at least as fast as Engineering. Probably Professor Young, to whom the President first broached the idea, should have objected more strenuously; but the circumstances were difficult. The department was not consulted at all in this matter; and rather resented this fact. Professor Holden continued to teach 4 sections of the Freshman course on Mondays, Wednesdays, and Fridays from 8 to 12, for the next 9 years, despite the rather

heart-felt complaints of the department to the President that his qualifications seemed inadequate and his teaching ineffective. And there were others.

So it came about that the department felt a sense of duty to be its brother's keeper. Consider for instance the first semester of 1927-28, the year Mr. Perkins joined the department. Twelve sections of Math. 1 (Trigonometry and Analytic Geometry) were divided as follows:

| | |
|---|---|
| Dean Bill | 1 |
| Mr. Perkins | 3 |
| Prof. Holden | 4 |
| Dr. Spooner | 1 |
| Mr. Hedlund | 3 |

Let us examine this candidly. Dean Bill taught on the Mon-Wed-Fri cycle at 8 a.m., and that was the last we ever saw of him. He had no further connection with the department, attended none of our meetings, and allowed us to correct his examinations for him. Mr. Hedlund was attached to the Office of the Superintendent of Grounds and Buildings; he held an engineer's degree; he had had some experience in teaching elementary mathematics. Professor Holden and Dr. Spooner I have mentioned. Mr. Perkins was a trained and thoroughly competent mathematician, he had had some teaching experience, but this was his first year at Dartmouth, and he had not yet completed all the requirements for the doctorate.

Now with that situation, the department -- and not without reason -- felt it was rather desirable to exercise some control over the final examination, its grading, and the final letter grades. I mention this as a typical case of the manner in which the principle of control (for cause) is adopted: first, it seems necessary; second, it marks a precedent: third, it becomes the accepted thing.

On occasion the Department went very far in exercising authority. In a certain multiple-section course several instructors who were bachelors, not at all interested in research, and relatively foot-loose as to time, organized special voluntary sessions for their sections -- not one or two, but a dozen. Other instructors, married, with small children, and still interested in research, were unwilling and unable to match this. Their students complained that they weren't getting an equal chance. (I am not at all sure these students really wanted these sessions; but especially in the month of March it is nice to have something to gripe about.) The department -- unwisely --voted that no such extra meetings should be held. Several instructors felt that their academic freedom was seriously jeopardized by such a vote, and an uncomfortable situation developed that was not ameliorated for some time.

It must be emphasized that the bulk of the procedures, customs, rules, and unwritten rules of the Department, were formed and crystallized in the Haskins-Young-Haskins regimes of 1921-1927.

Thereafter, Beetle was Chairman in 1927-31; Wilder 1931-35; Brown 1935-39; Perkins 1939-43; Robinson 1943-47; Brown 1947-51; Perkins 1951-55.

With deep appreciation of what their services meant to Dartmouth College, the author notes the passing of Professors Young, Beetle, Haskins, and of Dean Bill.

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Professor Young never lived up to his early reputation for research and writing. From 1910 to 1930 there was not the challenge at Dartmouth that he had known at Princeton. He slipped easily into a pleasant, and slightly indolent life. Gradually his interests transcended the somewhat narrow limits of the strictly mathematical. During a sabbatical leave he became interested in the History of Science, and on his return gave a course in this subject. He read very widely; and at one time inaugurated a lending library where the latest non-fiction and fiction books were available. He served a term as President of the Mathematical Association of America, and his retiring Presidential address was an able and eloquent appeal for mathematical service on every different level. A serious illness in the fall of 1931 compelled him to give up his classes. He recovered, and resumed his work in the second semester. But one noon, descending to the porch of Chandler Hall, he suddenly found that his strength was completely gone. He sat down on the balustrade, reached into his pocket, drew out the inevitable cigarette, and succeeded in lighting it. Beetle and Brown came out the door, and found him still conscious, but aware that the end was near.

Ralph Beetle gave 28 years of service to Dartmouth College. Every year, every day, was packed with action. The "impressive physique and lusty voice" of Ebenezer Adams was again in evidence. The physical vigor of Tute Worthen was reincarnated. The services of Bezaleel Woodward and Thomas Worthen as Judge of the Municipal Court were resumed by Professor Beetle. He was a good Committeeman, working well with other men, and the Athletic Council and the Administration Committee testified to the worth of his services.

He taught well, with vigor, and with obvious enjoyment. His early promise in research did not come to fruition, although at times he worked furiously. Characteristically, he selected the extraordinarily difficult four-color map problem. He never got anywhere with it, although he had a lot of fun. Inevitably he developed too many and too varied interests. But always he was a man's man. He worked hard, and played hard. His dependability was fabulous. If he offered to pick you up at your house at 5:50 a.m., so that you could take the 6:10 train at White River Junction, you could be sure he would pull up at 5:50, and not at 5:49 or 5:51. (The fact that he had probably played bridge until 3 or 4 a.m. made no difference.) Also he expected you to be ready for him .

He knew that a heart condition might take him off suddenly. He knew it, and said nothing to any one. His death, at the height of his powers, was as he would have wished.

The later years of Charles Nelson Haskins were on the whole pleasant ones. He had come to realize that he was something of a square peg and that he didn't fit into a round hole. He collaborated well with younger Chairmen in finding ways in which his formidable talents could be of service. He organized and taught a remarkable course in the determination of the orbits of comets and asteroids; and the dozen students who could stay with him will testify that this was a high spot in their academic careers. The Department experimented with a very substantial actuarial major, and Haskins was delighted to find a subject -- and a small select group of students -- where all inhibitions were off, and he could teach in the grand manner. Undismayed by a series of physical ailments which would have floored any one but a Titan, he carried on. He continued his very valuable services to the Library, and to the mathematical collection in particular. His last months seem to have been devoted to securing and organizing the Scandinavian contributions to statistical theory. But he was completely worn out, and when his work was through, he did not linger long.

The career of Earl Gordon Bill was an unusual one, marked by great heights contrasted with tragedy, and ending on this latter note. His hereditary background contained great good mingled with the doubtful. He was a precocious boy, graduating from Acadia University, Nova Scotia, at the age of 18; he followed this with five years at Yale where he took his Doctor's degree. All indications pointed toward a great career as teacher and research man.

He found Dartmouth congenial; he was a vigorous teacher, well liked by his students, and his advancement was rapid. President Hopkins, sensing great potentiality in him, recommended him strongly to the Canadian Government, and in World War I he was Director of the Canadian Selective Service Act. His outstanding record so impressed the Trustees that when they put into effect the new Selective System for Admission, they named him Director of Admissions, and Dean of Freshmen.

In retrospect, it is easy to see that Gordon Bill was a fine strategist, but not a particularly good tactician. The outstanding accomplishments of his life were the framing of the principles of the Canadian Selective Service Act, and the formulation of the Selective System at Dartmouth. These were pioneering jobs; very ably carried through. But he was not a good Dean of Freshmen. The day by day interviews with the lazy, the stupid, and the maladjusted tired him and worried him. An administrative reorganization followed, and he was made the first Dean of the Faculty. Neither the President, nor Dean Bill, nor any one else knew exactly what he was to do. At that time, Gordon Bill told me that this was going to be a great change for him; whereas in his old position he had had to make a

snap decision every five minutes, now he would probably come up with a decision about once in three months. Nothing could have been further from the truth. The Office is an exacting one: crammed with detail. Unless the Dean developes great powers of resistance he is going to hear the ambitions, envies, discouragements, and love-lives of a considerable portion of the Faculty. (Mathematicians, who are a notoriously close-mouthed group when it comes to their personal affairs, can hardly imagine the readiness with which their colleagues in other fields take their personal problems to the Dean. The author speaks with deep feeling; he acted for the Dean in that office for nearly two years.)

The job was too much for Dean Bill. He was a curiously sensitive person; he worried about other people's worries. In a small town like Hanover there will be half a dozen outcrops of ugly rumors in a year. On investigation, five of these will prove to be nothing but unfounded gossip; the sixth will be a nasty mess requiring the most delicate handling to avoid lawsuits and unsavory publicity. He incurred the hostility of the Faculty by being available for only 2 hours a day, from 9 to 11 in the morning. Actually, that was all he could take. The rest of the day he played hard, and tried to forget. After a purely nominal connection with the Department, he dropped that altogether.

Once, again, he showed his ability. His strategy in organizing the Faculty for service in the Navy V-12 unit was splendid. But the day-by-day tactics sapped his strength, and by 1945 he was in a much more serious condition than any one realized.

The resignation of President Hopkins, and the election of John Dickey to the Presidency was a terrific blow to him. The thought of the new adjustments that must be made was too much for him to face. Several periods in a sanatarium gave only spacious improvement; the rest is stark tragedy.

Now it is extraordinary, but it is a fact that during all the years from 1928 to 1945 no additions were made to the department of mathematics except on the most temporary basis. We lost some of the older men, but we made no replacements. and so it came about that by 1943 there was a group of seven with services beginning as follows:

| | |
|---|---|
| Mathewson | 1914 |
| Forsyth | 1916 |
| Silverman | 1918 |
| Wilder | 1922 |
| Brown | 1922 |
| Perkins | 1927 |
| Robinson | 1928 |

This was a seasoned group of veterans; a rugged outfit, not brilliant, but dependable, not without a touch of the Spartan, and inclined to be a bit intolerant of the more easy-going members of the college community. We had survived a depression, in which we

tightened our belts, taught more and larger classes, paid our own expenses to Society meetings, typed our own letters, and pared a very frugal budget to the bone. But every year this group grew one year older. There were differences of opinion; but no warring factions. Rules and regulations became simply the way we did things. And there was no particular reason for us to consider how they would strike others. Forsyth once remarked to me: "It's going to be rather tough on us some day to have a new fellow in this group"; and to this I answered: "I think it will be even tougher for him". (I take especial pleasure in quoting this, because it was one of the very few times I ever got the better of Chester Forsyth.)

The story of the war years is utterly fantastic, and does not need to be spelled out in too much detail, except to indicate the need for a college of liberal arts to show adaptability in an emergency. Credit for the initial step goes to Professor 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, either way, this had on the outcome of the war.

The mathematics for the Navy V-12 unit (2,000 men, the largest in the country) was put under the charge of the author. In the summer of 1943, we organized a refresher course for faculty members, and at the conclusion the following thirteen brave souls were duly appointed Associates in Mathematics:

| | |
|---|---|
| Edwin M. Bailor | Psychology |
| William W. Ballard | Zoology |
| Robert K. Carr | Government |
| William A. Carter | Economics |
| Merle C. Cowden | German |
| James F. Crow | Zoology |
| Robert H. Denison | Zoology |
| Gordon H. Gliddon | Physiological Optics |
| Charles J. Lyon | Botany |
| Warren E. Montsie | Romance Languages |
| Robert E. Riegel | History |
| Philip E. Wheelwright | Philosophy |
| John R. Williams | History. |

In addition, we gave temporary appointments to:-

Dr. Frank M. Morgan
Col. Richard H. Somers
Rev. Bernard Holmes, O.S.B.
Rev. Charles Tucke, O.S.B.
Mr. W. Cutting Johnson
Mr. David B. Kirk
Mr. Leo Lapidus

Throughout this period, the Department functioned as a unit, exactly as it had for years, under the able Chairmanship of Professor Robinson. There was no slackening of standards for college courses. Professor Robinson saw to it that every Dartmouth undergraduate (of course their numbers were greatly reduced) had the course he was fitted for, taught by one of the regular members of the Department.

I don't think the Navy mathematical program was a particularly good one, but then it was not of our making. The V-12 men were obviously not as well prepared in mathematics as our Freshmen were. For one term we followed the prescribed Navy courses fairly literally; after that we effected bold compromises between the prescriptions and what our consciences told us was good for the boys. The course material was crowded, hurried, and at times irksome. Both groups of Associates taught with more enthusiasm than the regulars, which is fair enough--no professional mathematician likes to have it spelled out for him. Unless you have actually taught spherical trigonometry 3 times a week for 15 weeks, you have no idea how barren a course it is, how little of value there is here, and how widely this departs from the type of education that pertains to a college of liberal arts.

I think it is fair to say that we emerged from the V-12 chaos with the feeling that we had done the best we could; but that we were extremely thankful it was all over. We had taught prescribed courses whose values we doubted, to students of inferior calibre. Forced to do new things in a new way, we may have been shaken somewhat from the complacency of long years of association together; but we decided--and I think objectively--that these were bad things, and we would not willingly do them again. But we generalized too naively when we decided that

(1) continuous session throughout the year is inherently bad,
(2) mathematics 5 times a week is inherently bad.

If anything then, it may well have been that the somewhat extraordinary experiences of 1943-45 produced a reactionary effect on the seven regular members of the Department. The old ways were good; we had always thought so; and how we knew it.

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It has been previously stated that no additions had been made to the Department since 1928. In the intervening years we had lost the services of three full-time men; in addition, Professor Wilder's illness deprived us of his services. We were teaching almost the same number of courses and students; and this had been gradually effected by increasing the number of students in the sections of the large courses. Haskins' sections of 24-28 versus Young's of 12-20 rather paled into insignificance in comparison to the 35-50 men sections which were now by no means uncommon. There were members of the department who thought this was good; and others thought the change bad; but this had gradually happened over the years.

At the end of the war, a mathematical emergency replaced the national. We started recruiting, and welcomed to our group:

Prof. Thomas C. Doyle
Dr. W. H. Durfee
Dr. W. C. G. Fraser .

Several other men were engaged on a more temporary basis.

Now while there were no open breaks, and while we got along together reasonably well, it gradually transpired that the younger group were not particularly happy about some of our rules and regulations of long standing. It was not so much the rules themselves that they objected to; what they didn't like was the fact that there were rules. And it really was surprising how many rules we had on our books; rules that dated back to the days when Haskins was in his prime.

I was Chairman in 1947, and at that time I wrote a brief summary of the history of the mathematics department, which I read to the department. I hope it will not be too boring if I quote the two pages that concluded that summary.

"..... This is something of the background of the department. I hope that what I have said is objective and fair; I hope you see that many of the customs and rules that we have are the natural product of this long association of 7 men together. And I hope I have justified the claim that some of these rules have values that have stood the test of time.

"But now I want to say to all of you that the heptarchy of Mathewson, Forsyth, Silverman, Wilder, Brown, Perkins, and Robinson, which existed from 1927 to 1945, simply no longer exists. We have now made additions to our group, and we shall make more. We want them to enjoy their work as much as we have ours; we want them to get along together as well as we have. We want Dartmouth to be thought of as a good place for a young mathematician to begin his career.

"I want to be sure that a young man coming here can in every respect retain his dignity as an individual. If things disturb him that have not disturbed us, I want to know what they are, and what can be done about it. I want to be sure that our ways of doing things neither obviously nor insidiously detract from his independence and from his development of personal integrity.

"I believe that some of our rules may very well do what I don't want them to do. I believe that--reasonably or unreasonably--they are resented by the younger men.

"I therefore ask the Department to authorize the Chairman to name a Committee of Three to study the Rules, Regulations, and Unwritten Laws of the Department, and to report later to the Department such recommendations as they may feel proper, for such action

as the group may wish to take."

The Department voted this, and I named a Committee. They brought in a report which virtually abolished all the Blue Laws of 20, 30, and even 40 years standing. Everyone felt better about it--at least, I hope so.

For years the Department had relied almost entirely on mimeographed pamphlets in analytic geometry and the calculus for Freshman year. The younger men didn't like these; they thought they were superficial; and they would have preferred to teach other things, although they could not agree on just what they wanted. Durfee wanted some abstract algebra in the Freshman course; and naturally the other science departments and the Associated Schools took a dim view of this. Fraser wanted more rigor in the calculus. All of them thought the analytic geometry was excessive. When Robin Robinson brought out his really very excellent book on this subject, they felt (1) that we would use it, and (2) that we would spend even more time on this subject than we had. Naturally (1) was a fair prediction; I don't think (2) was. But if they had to teach analytic geometry, they would have preferred a more rigorous text such as Murnaghan's, or a vector treatment. But the older group considered Murnaghan unteachable; and with the conservatism of old age, they didn't think a vector treatment suitable for Freshmen.

Looking back on the period from 1945 to 1953, in retrospect, two things stand out. 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 homogeneous a group, which meant we didn't have enough contacts. And 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. We loaded them up a little too heavily with Freshman courses which they disliked. And 6 men who have lived together and worked together for more than 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. And with no graduate courses to teach, an ambitious young man can hardly be blamed for wishing to go to an institution where he can engage in that kind of work.

The man primarily responsible for the change in the Department was the late Donald H. Morrison, then Dean of the Faculty. Since I served in that Office in an Acting capacity for nearly two years before his appointment, I know pretty well what he was up against. 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.

This last needs amplifying. Promotions with tenure are first recommended by the Department, then considered by the Committee Advisory to the President, and then acted on by the Trustees. The Advisory Committee very seldom turned down a Departmental recommendation. This Committee, elected by the Faculty, tended to consist of conservative men who disliked a quarrel, and were willing to pay a pretty high price for "harmony". Their thinking was mostly along this line: "Is there any reason why we shouldn't promote this man?" But a Faculty does not become great unless this thinking is replaced by: "Why should this man be promoted?" In general, promotions were pretty well assured; but they might be very slow. An instructor or Assistant Professor might wait 10, 15, 20, or even more years before receiving tenure--but eventually he usually got it. After World War II, it was an old Faculty, and getting older. In the 1920's there were at one time exactly 3 Emeritus Professors; today there are 75. Dean Morrison had a double problem: to recruit, but to abolish the prevalent feeling with regard to tenure. His success in handling this problem is today a case history in successful administration. (With preservation of anonymity, it is used by The Institute for College and University Administrations.)

Dean Morrison told the Mathematics Department 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. The amount of money actually spent on recruiting would have amazed Young, and horrified Haskins.

One more thing 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.

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This is not the time to describe and assess the progress made by our younger group who came here after 1952--progress which has changed the Department from a good average outfit into

an outstanding one. The author, now retired, is not competent to even start this; but he does wish to express his satisfaction at leaving the Department in better hands and in better shape than it has ever been since the days of Bezaleel Woodward.

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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"