UCSC Math, the Early Years

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Abstract

During May 2017, the UCSC Math Department asked me to give a celebratory colloquium on the founding of the department. I decided to include the first thirty years, $1965 - 1995$. Most of the data included in this survey was obtained from interviews with our senior colleagues, or excavated from the Special Collections Room of the UCSC McHenry Library.

CONTENTS

1 Introduction

Dear friends and colleagues. We meet today for our fiftieth reunion. I feel really honored and fortunate to be here. The preparation for this talk, which covers the first 30 years of our story, has refreshed my memory of so many experiences. I am grateful to Tony Tromba, Jie Qing, and Michelle Dohl for the invitation, to many colleagues and former students for sharing their memories, most especially Al Kelley, Richard Mitchell, Dan Friedman, and Evan Schaffer, and to Irene Reti and her staff at the McHenry Library for their great patience.
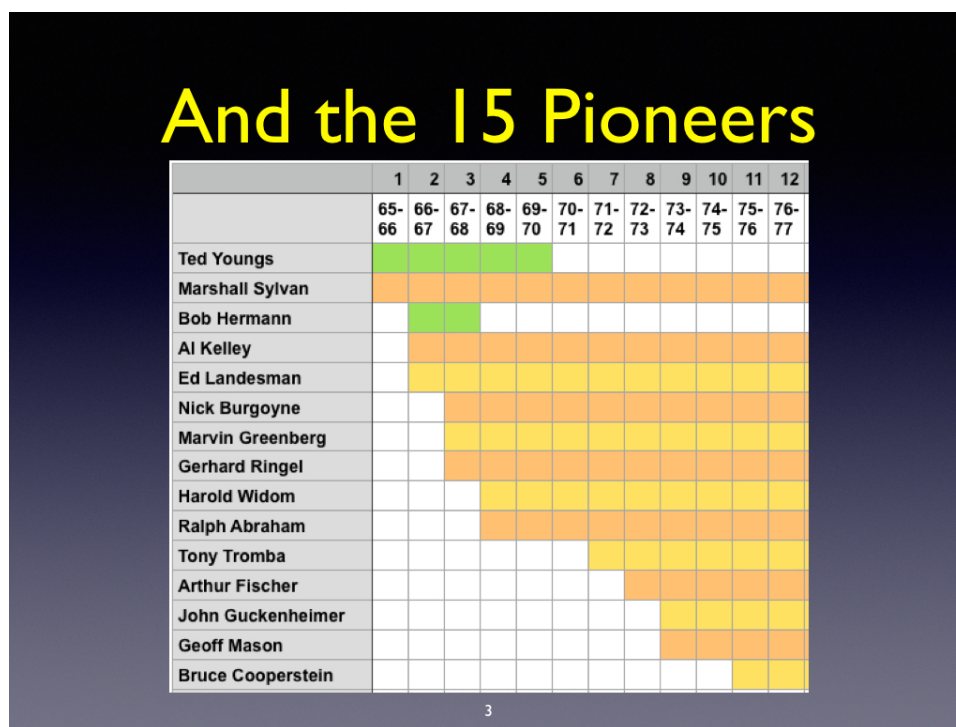
1.1 The pioneers

Figure 1: The long stay pioneers.

Figure 1 shows the upper left corner of a more extensive graphic that I will share with you presently (Figure 10). Here you see all of the long stay members, up until the thirteenth year. In twelve years we have 15 pioneer staff,. In this figure green means staying for a shorter time. Ted Youngs died prematurely, and Bob Herman

left, I understand, because of a disagreement with the administration. We are here to honor these people, as they gave shape to this math department/.

1.2   My prehistory from 1958

My own story in math started in 1958, when I joined the math department at the University of Michigan. Finishing my PhD in Spring 1060, I was lucky to get my first job in Berkeley, because it had become overnight a first-class mathematical center. The governor of California, Pat Brown, had decided that California would follow Detroit into oblivion unless they really pushed science and math. So with the aid of a huge grant, in the fall of 1960, Berkeley became the home of a number of very famous and capable research mathematicians. Apparently by accident, I happened to be in this special place and time. And there I met some people – including Steve Smale, Marvin Greenberg ,Nick Burgogne, Al Kelley, and Harold Rosenberg – who figured eventually in the history of math at UCSC.

After two years in Berkeley I went to Columbia, also a good and modern math department, with great masters, like Sammy Eilenberg and Serge Lang.. Steve Smale was there also, In 1964 I went on to Princeton, another great math center, with Solomon Lefschetz and John Milnor. There I met Tony Tromba, Arthur Fischer, and Jerry Marsden, who were graduate students at the time. I was there for four years. In the first year, I was assigned an honors calculus course to teach. It had fifteen students. One was still in high school, the others were all freshman, and they were great students. When I moved on to the sequel course the following year, they all followed. For four years in a row they were my star pupils, and eventually all got PhDs and became professors.

1.3   Meeting Santa Cruz, March, 1968

In my last year at Princeton, I had an offer from UCSC. I had been recruited by Bob Herman. Phil Bell, the new provost of the fourth college, came to Princeton to interview me, and we liked each other. I decided to go and have a look, although I had no intention of accepting the offer, preferring to stay at Princeton. But I then went ahead and visited Santa Cruz. I had an interview with Vice Chancelllor Clauser, and we were both displeased. We had a disagreement, and I think that influenced my further history in Santa Cruz in the following years.

I was prepared for Santa Cruz by a couple of experiences I had at Princeton. First of all there was my first LSD trip, in the beginning of that last year, November of 1967. And secondly, there was my initiation into student politics. SDS was active on campuses, not only in California but throughout the East Coast and even in Europe.

I joined a group of students who occupied the president's office. The goal of this action was to make Princeton co-ed, and we succeeded.

With this behind me, I came to Santa Cruz to have a look at it, and I was surprised by a couple of things. One was the ongoing political activity on campus, mostly around the issue of the Vietnam war. And on the other hand, the Hip subculture was flourishing in downtown Santa Cruz. Comparing Santa Cruz in the Spring of 1968 with Princeton at the same time, I had to accept the offer.

1.4 Berkeley, Summer, 1968

My transition from Princeton to Santa Cruz was punctuated by a summer conference at UC. Berkeley. This was a summer-long event sponsored by the American Mathematical Society, on Global Analysis, which was a popular name in those days for a branch of mathematics in which Dynamical Systems Theory was understood as a technology for reorganizing the whole of mathematics. It was global in the sense that the globe of mathematics was going to be taken over by a new paradigm, and also in the sense that it opposed the traditional focus on spatially local analysis. I wanted to go to that conference enroute to Santa Cruz, and many of my Princeton students wanted to go also,

So we invented the Eagle Flying project/ We proposed to write a series of new math textbooks, sell the idea to a publisher, and use the money to sponsor our trip to Berkeley. The idea of the Eagle Flying Series was to enable a new way of teaching mathematics in universities, in which vector calculus would follow, rather than precede, linear algebra. I wanted to make this minor switch in the teaching of mathematics in universities, because I thought students would learn better and teaching would be more fun, I tried without success to float this idea at Princeton. This was one of the reasons for my decision to move to Santa Cruz. I felt that I could start teaching mathematics a new way in Santa Cruz because it was a new university. And the excuse that a traditional math department might give for not teaching mathematics my way was that there were no textbooks for it. So, we would provide them. The Eagle Flying group, mostly students from Princeton, in the course of eight weeks in Berkeley, would produce twelve new textbooks for a new math program. Tony Tromba and Jerry Marsden were among them.

We rented a large house near the UC Berkeley campus, and the Eagles lived there communally and worked on these books. In the daytime we went to this extremely interesting conference in the UC Berkeley math department, which is memorialized in two thick volumes edited by the organizers, Steve Smale and Shing-Shen Chern.

1.5   Santa Cruz, Fall, 1968

At the end of the summer conference I moved to Santa Cruz. From the first day at UCSC I got on the wrong side of the Chancellor, Dean McHenry.

First of all, I arrived on campus for my first day of work on a motorcycle. But McHenry hated motorcycles. In those days there was a kiosk that you had to pass through to get on campus. So my misdemeanor was reported to McHenry.

The next thing that happened was a UC Regents meeting. These meetings rotated from campus to campus, and this particular one was on the UCSC campus in October, 1968, shortly after my arrival. Student activists planned a protest march to greet the regents when they arrived on the UCSC campus. They asked me to march at the head of the crowd. This became my second misstep, as explained below.

2   The Birth of Math at UCSC from 1965-66

We may now trace the growth of the UCSC Math Department person by person, from the first hires. We may classify these people as long stay, short stay, and no stay.

UCSC is structured as a network of colleges. The network was to evolve by adding one college each year. The chancellor was to choose a provost for a new college, and the provost was then largely responsible for attracting the college faculty, who would then determine the college focus and core curriculum.

As time went on, this structure failed, and the College role in hiring faculty was overcome by the power of traditional departments. Page Smith, the founding Provost of the first college, later wrote:

> The University of California at San Diego and Santa Cruz both attempted to base undergraduate life on colleges that would, in aggregate, make up a university. These efforts, promising as they were in many respects, failed, largely because the colleges were in competition with the entrenched disciplines represented by the departments that ate them alive.[1]

So that's the post-mortem on what happened to Santa Cruz and how it changed from an experimental university into the more traditional university.

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[1]*Killing the Spirit*, 1990; p. 299.

2.1 The first hires

My arrival in 1968 coincided with the creation of the fourth college. My account here of the first three colleges is thus based on interviews and records from the Special Collections of the UCSC Library. Let us take these up, one at a time.
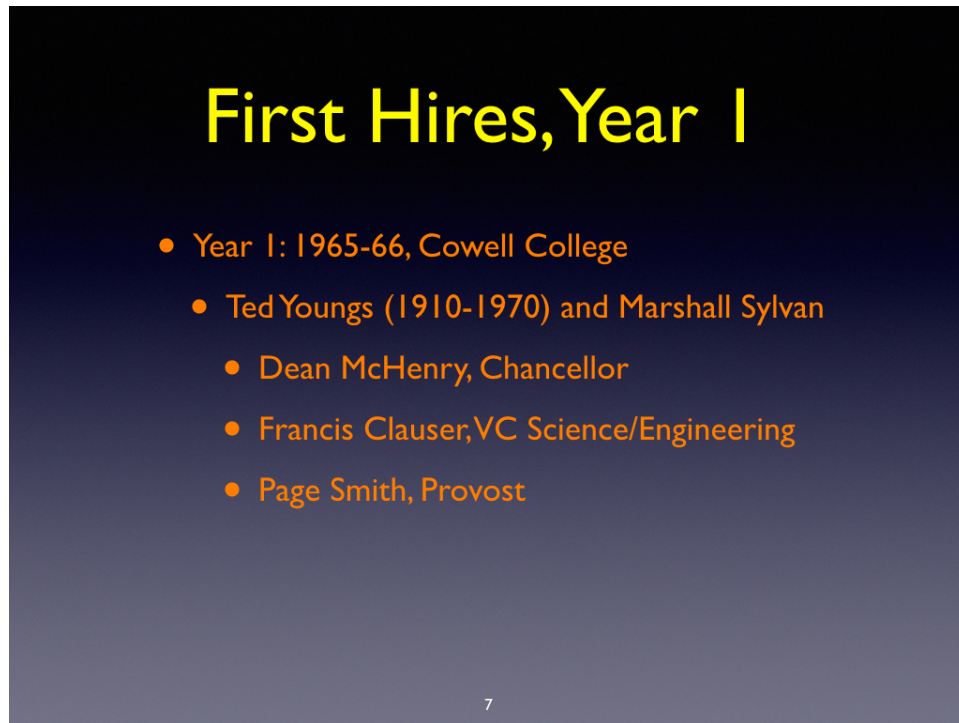

Figure 2: Year 1. Chancellor McHenry, Vice Chancellor Clauser, and Cowell College Founding Provost Smith recruited Ted Youngs and Marshall Sylvan.

Figure 3: Year 2. Chancellor McHenry, Vice Chancellor Clauser, Stevenson College Founding Provost Page, and Math Chair Ted Youngs recruited Bob Herman, Al Kelley, and Ed Landesman.

Al wrote in an email to me:

> Bob Herman had a huge effect on forming our department. I was actually recruited by McHenry.

Ed said:

> McHenry had taught and been an administrator at UCLA. ... He came down to interview me. I still remember that interview quite clearly.[2]

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[2]From Ed's Regional History interview with Irene Reti, 2016.

Figure 4: Year 3. Chancellor McHenry, Vice Chancellor Clauser, Crown College Founding Provost Thimann, and Math Chair Ted Youngs, with Math Professors Bob, Al, and Ed, recruited Nick Burgoyne, Marvin Greenberg, and Gerhard Ringel.

Marvin wrote in an email to me:

> The main people I remember are J.T. Youngs, Al Kelley, and Bob Herman. I was amazed that Bob Herman was unhappy and left he following year. Youngs . . . appointed me Recruiting Chairman. I proceeded to hire you [Ralph], Nick, and Widom.

Figure 5: Year 4. Merrill College Founding Provost Phil Bell, and Math Recruitment Chair Marvin with Professors Bob, Al, Ed,, Nick, and Gerhard recruited Harold and me.

Harold wrote in an email to me:

> I more or less recruited myself. If you had to name a recruiter it would be Ted Youngs. ... the college system made it difficult to hire the best people.

And I recalled:

> I was recruited by Bob Herman while I was an assistant professor at Princeton. Phil Bell came to Princeton to interview me; we were both pleased. I visited UCSC in March of 1968 and interviewed with Francis Clauser;. We were both displeased.
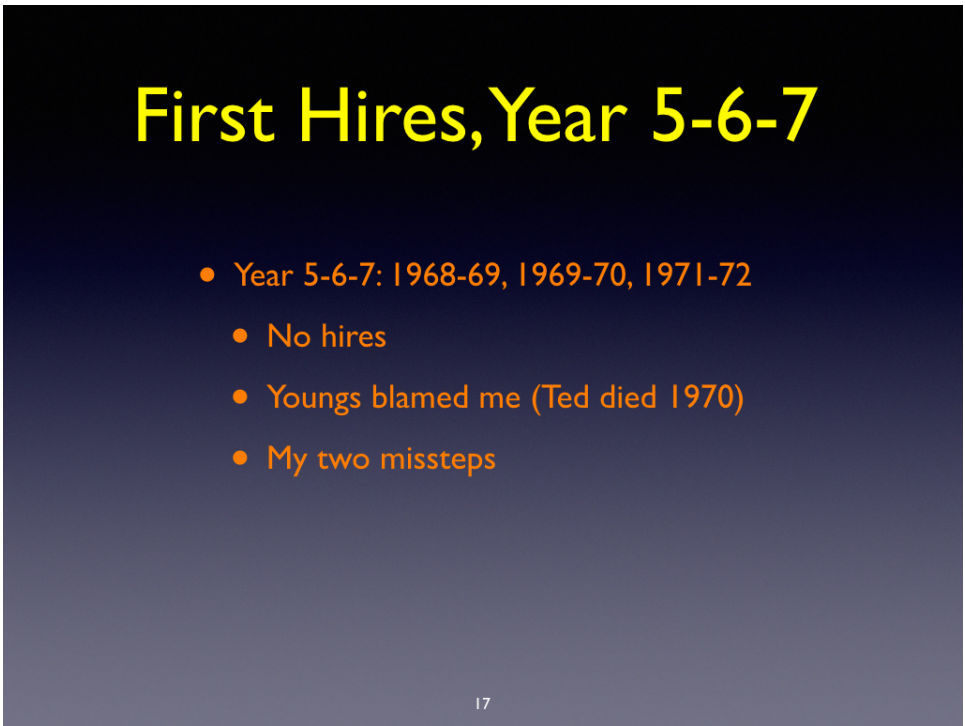
Figure 6: The lean years.

2.2 The lean years

In the next three years, there were no hires. There was a theory for that.

> *Since I had misbehaved, annoying McHenry to the point that he could not sleep and suffered severe depression, and since I was in the math department, therefore the math department must be punished. Math could never grow in Santa Cruz, because of me.*

Some colleagues, including Ted, believed this theory. And I kind of believed it myself, until this past month, when my research in the Special Collections Room of the McHenry Library, of all places, exonerated me.

So here's my second misstep, in more detail.

Figure 7: Ralph and Paul at the Regents meeting.

2.3   The Regents meeting

The Regents meeting on the Santa Cruz campus happened to coincide with a huge student action for several goals:. the end of the war in Vietnam, more academic freedom, lower tuition, and civil rights. They head of the student union was an student from Vietnam.

Some of these student activists attacked the bus that was carrying the Regents around the UCSC campus. They attempted, by rocking it from side to side, to roll it over, with the regents inside. But they failed to turn it over.

One part of this protest was a march led by a pig on a leash, and two professors, Paul Lee and me. Figure 7 shows Paul Lee, dressed in his academic robe, and me, in my American flag shirt. But that photo, published in the Los Angeles Times, was just part of my problem.
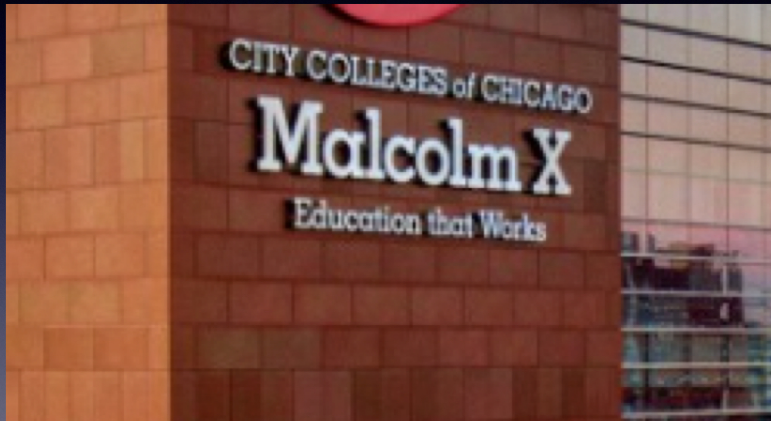
Figure 8: Another College of Malcolm X.

2.4 The Bill Moore affair

At the same time this Regents meeting was happening, we were visited by Bill Moore, who was head of the Black Liberation movement in Santa Cruz County, and associated with the Black Panthers in Oakland.

I arrived in the year of College 4, so College 5 was in planning and about to open, and College 6 was in some kind of planning, and no one had an idea yet about College 7,

Then Bill Moore had an idea. He was working in Santa Cruz, and he was aware of the growth plan of UCSC, college by college. He had an idea for the improvement of the UC System, and that idea he called, The College of Malcolm X.

I heard about it off campus. My house was next door to Santa Cruz High School. Walking home one night, I heard a commotion going on in the high school. There some black people with red berets, and Bill Moore was speaking.

He said that College 7 should be a place that would be home for minority students,

which would reflect their culture, their food, their religion, their play, their color schemes, their everything. It would aid attracting and retaining minority students. It should be called the College of Malcolm X, because Malcolm X was a hugely popular leader of minorities, he was brilliant, and he was adequately non-passive.

Bill Moore said he had this idea for College 7, but they will not let him speak on the campus. So I went up to him after his talk, and I said, I'm a professor there, I'm a fellow of Merrill College. We have academic freedom. Anyone can speak on campus. And so I invited him. And when he arrived at Merrill College to speak, at my invitation, he was escorted off campus by police.

So I got rather in trouble over my support of Bill Moore, academic freedom, and so on. UCSC tried to fire me. I had to get a lawyer, who was Evan Schaffers father, who saved me. Many professors came to my support, because I had tenure. If they could fire me with tenure, everybody was unsafe.

As you know, College 7 is now called Oakes College. So as Bill Moore broke into the Regents meeting in October of 1968 demanding a new plan, a better plan for College 7, he was told that, "Well, we can't do that, because the name of the college is not chosen by the Regents. The name of the college is sold to the highest bidder, and the price tag today is $100,000." So Bill Moore and I and Paul Lee set about trying to raise money among the faculty. We did raise almost half of the desired amount, but we were defeated anyway. Somebody later succeeded in making a College of Malcolm X, as shown in Figure 8, but it was not at UCSC.

Irene Reti told me that there was an interview with McHenry in the library. It had been transcribed and was online. He was interviewed by Elizabeth Calciano in January of '69, just two or three months after the events we're talking about. So I consulted it, and a little bit of what I found is shown in Figure 9.

Regarding my responsibility for the lean years of the UCSC math department, note that McHenry said in his interview,

> "Well, it's gone to their head?"

head singular., but,

> "But don't worry, they're so high priced?"

they plural.

Here is my exoneration. It's not only me. Me and somebody. Bob Herman was the one with a beard. Me and Bob Herman. We drove him crazy, and made a dent in the development of the math department in the lean years.

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McHenry interview by Elizabeth Calciano
p. 74-75, JANUARY 8, 1969

McHenry: Indeed, I have more disciplinary
problems in the faculty in mathematics than anyplace
else.

Calciano: Disciplinary in what way?

McHenry:  Well ... misconduct and alleged
unprofessional conduct
of various kinds; stirring up rows in the community;
getting adverse reactions in public; writing letters
to the editor.


.....

McHenry:  This year it's concentrated in mathematics.

Calciano: (Laughter) It seems such a staid field, that
you
wouldn't....

McHenry:  Well it's gone to their head; they're so
high-priced,
and bright ones are so hard to get. They really ...
they grow beards and act eccentric and....
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Figure 9: McHenry's interview.

2.5 The 30 Year Horizon

I want to show you some graphics of the further evolution of the math department. Here I will distinguish three categories,

Long stays (those who came and stayed on for six years or more,

Short stays (who came for a few years then moved on), and

No stays (whom we tried to appoint without success).

This is a histomap, that is, a spreadsheet of long stays in chronological order for the people mentioned already, and all those who followed up to year 30. Those who stayed for six years or more are represented by yellow or orange time-bars. Those who stayed five years or less are green. Here we see all 24 long stays of the first 30 years.

Note the long span from year 11 up until year 20. No permanent positions were appointed. That could not be my fault, because from the early lean years up until year 11 people were being appointed every year, even after I had misbehaved.

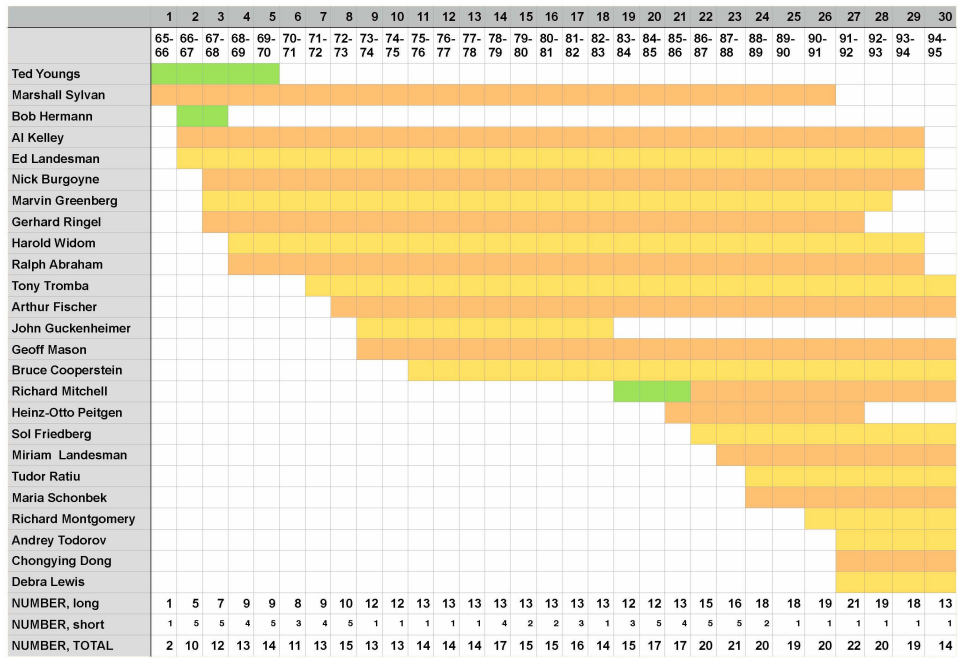|		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
		65-66	66-67	67-68	68-69	69-70	70-71	71-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95
Ted Youngs																															
Marshall Sylvan																															
Bob Hermann																															
Al Kelley																															
Ed Landesman																															
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Maria Schonbek																															
Richard Montgomery																															
Andrey Todorov																															
Chongying Dong																															
Debra Lewis																															
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NUMBER, short		1	5	5	4	5	3	4	5	1	1	1	1	1	4	2	2	3	1	3	5	4	5	5	2	1	1	1	1	1	1
NUMBER, TOTAL		2	10	12	13	14	11	13	15	13	13	14	14	14	17	15	15	16	14	15	17	17	20	21	20	19	20	22	20	19	14

Figure 10: Histomap of long stays, first 30 years.

Of course, besides these long-stay people, there were twice as many short stays: visiting assistant professors or lecturers, and so on.

Figure 11: Short stay histomap.

Here are the short stay people. You can't read their names in this figure, so I have listed them in chronological order in the next two figures.

I have highlighted the ones that were especially important to me: Karl Morgenstern was one of my students from my first advanced calculus course at Princeton. Harold Rosenberg was a student, along with Al Kelley ,in my first seminar at Berkeley. Dick Palais became president of the American Mathematical Society, among the first who were really computer literate. When he was here he wrote a program for research in chaos theory, which we used for many years after he departed. Shub was an ubdergrad in the math department at Columbia in my time there with Steve Smale. Richard Cushman was another of my graduate students at Princeton.

Gottfried Mayer-Kress was a physics PhD from Germany who was very good with modeling and computer graphics. Tim Poston, one of the leading people in catastrophe theory. And Tom Lehrer of course. So these were the 41 short-stay people in the first 30 years.

Figure 12: Short stay list 1.

Superimposed over the histogram bars I have approximated the counts with the black graph. This shows the slope to be expected from the linear growth of the student population and the constant student-faculty ratio of 18 to 1. The flat line of the middle years indicates the starvation of the department mandated by our administration for unknown reasons.

This information comes from the UCSC General Catalogs, which are available in the Special Collections Room. I took the names of the faculty, long-stay and short-stay, from the General Catalog. I did notice a few errors. For example, there were four or five short-term people we've had who helped out with the computation program. They all came from Germany. None of them are mentioned in the General Catalog, so it seems almost like a systematic omission. Whoever wrote and proofread the copy for the General Catalog might have had a systematic oversight.

So, here's the same graph, augmented with further data from the files in the Math Department office. They cover only from year 19 up until the present. For some reason the counts in the department files are much higher, but they have the same shape.

Figure 13: Short stays list 2.

Besides the long stays and the short stays, there were four notable no stays. These were people who wanted to come to Santa Cruz, and for whom we could not get an offer because of opposition within the math department or from the administration:

Steve Smale, later president of the American Mathematical Society,

Harold Rosenberg, later chairman of mathematics in Paris,

Jerry Marsden, who became a leader in applied mathematics, and

Richard Cushman, who settled in Holland.

.All were of special interest to me.

3 Tracks

Now we come to an important bifurcation in the UCSC math story, the multiplication of tracks. In the first few years, there was only one track, the pure math track. All students, graduate or undergraduate, were studying for a degree in pure mathematics.
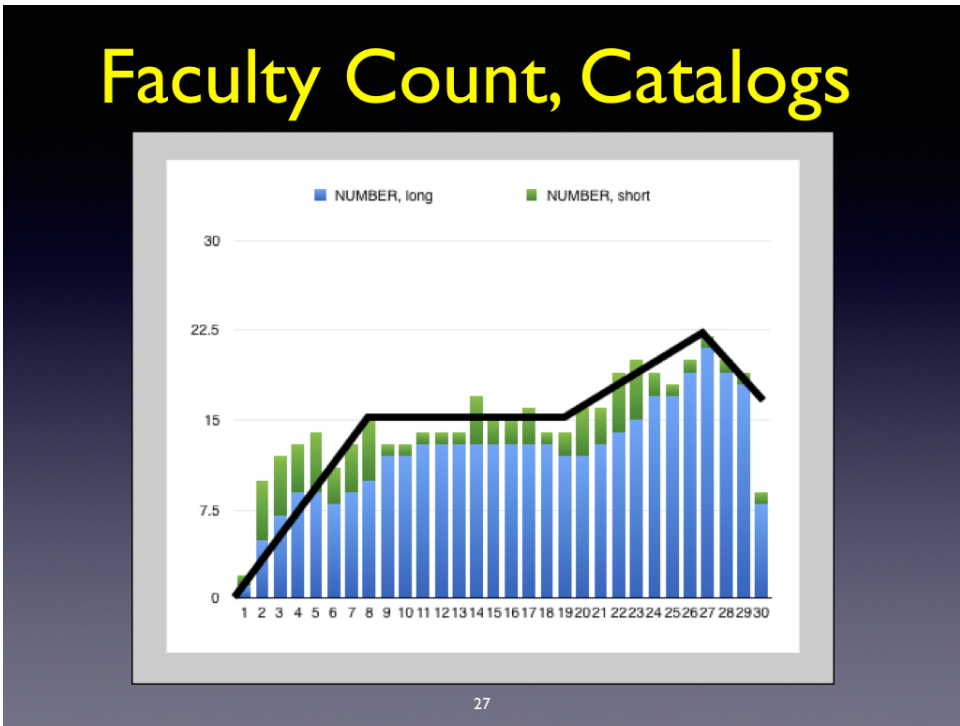
Figure 14: Number of faculty by year according to the UCSC General Catalogs. Long stay counts in blue, short stay counts in green.

3.1   Origin of the four tracks

A lot of people in the sciences who wanted math support — if not applied math, at least applicable math, tools that they could use in their work.

And it happened that Santa Cruz had, early on, an advanced computer department. We had Harry Huskey, a large mainframe, programmers, engineering support, and so on. This enabled Al Kelley to begin giving courses in computational mathematics, which led to our computational math track.

In fact, we started new tracks in applied and computational mathematics in the same year. And a couple years later a fourth track was added, the education track, created by Ed Landesman.

The time frame of these developments is shown in Figure 17. The pure math track existed from the beginning, and only after year 20 or so, came the new tracks.
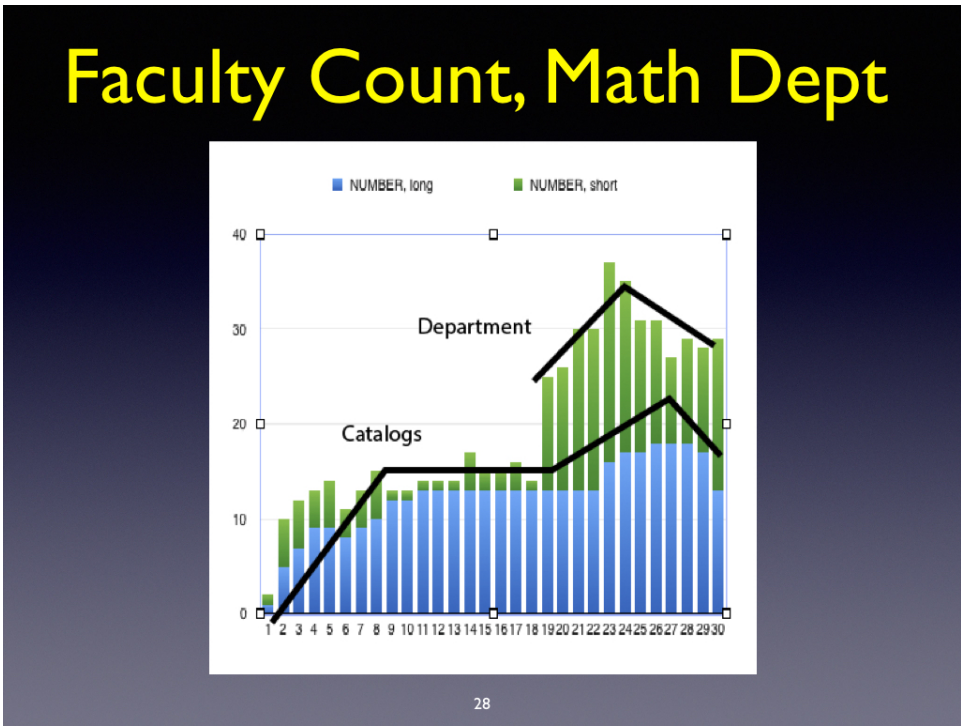
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Figure 15: Slide 28.

3.2 The Visual Math Project

The evolving computer science program eventually acquired a plotter and a computer
graphics monitor.. After using this equipment for dynamical systems and chaos
theory research in 1974 I saw the possibility of using it to enhance the teaching
of elementary courses. One of the earliest of these courses was one I co-taught
with Evan Schaffer called Calculus and the Computer, in which we attempted to
investigate theorems of ordinary calculus using, computation and computer graphics.
This course was a great success. It was highly educational for me and Evan, as well
as for the the students. We found that you can actually learn math by writing code
and by having adequate graphics.

Later we used graphics equipment to add computer graphics to several of the
introductory math courses: Precalculus, calculus, linear algebra, and ordinary dif-
ferential equations. This became the Visual Math Project, supported by California
state funding. Our software ran on the UCSC Computer Center mainframes, draw-
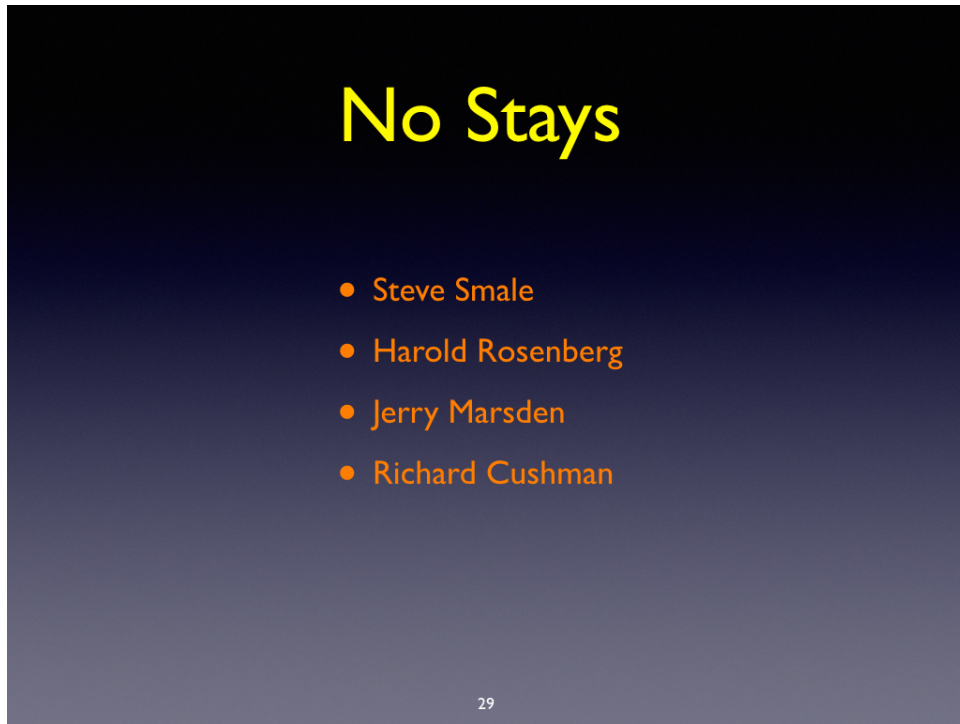ing images on a graphics terminal there, with a video camera pointed at it. A video

Figure 16: People not appointed.

cable ran down the corridor to a monitor in the classroom.

3.3   Courses and students in the tracks

Demand for the gradually growing courses led to a formal program in applied and computational mathematics that required a certain number of applied or computational courses for the degree. The growth in the number of computational math courses is shown in Figure 18.

The number of computational courses gradually increased until year 21, and then fell, after the demise of the math department that occurred with the Very Early Retirement Incentive Programs (VERIPs) of the 1990s, when most of the computational people retired. There i s still a computational track, but there are not so many courses.

The number of BA degrees in each of the tracks is a matter of record, and is shown in Figure 19. The blue are pure math BAs, the green are computational, and the yellow are applied.
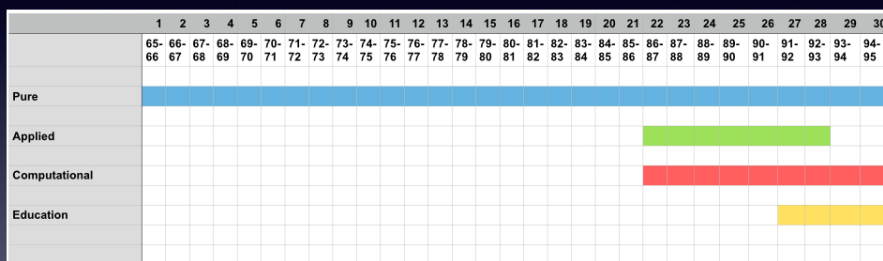
Figure 17: Math tracks from the beginning.

So during the heyday of computational math, something like one third of the BA degrees awarded were in the computational track. With Al Kelley's lead we created one of the first programs in computational math in the United States.

4   The demise

The demise of the math department resulted from the severe acrimony and disappointment over appointments and promotions of staff. This demise occurred before the catastrophe in the budget of the State of California that forced the UC administration to offer an irresistable VERIP, and about forty percent of the UC faculty statewide retired on the same day in June of 1994.

Our math program was about two thirds pure and one third computational. We had a growing number of students and we needed more professors. Everybody wanted an appointment for their own specialty. There were fights in which people would try to drive away the computation professors to make space for pure math. Splits
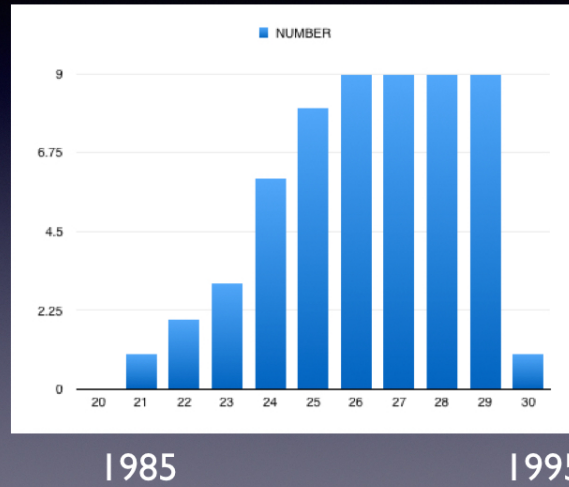
Figure 18: Number of computational courses by year..

between geometry, algebra, number theory, whatever, but most especially between pure and computational math, pretty much destroyed the morale of our department.

Two special cases, the appointments of Peitgen and Todorov, brought to the foreground the split between pure and computational math. My theory here is based on the political strategy of *negative voting.*

Figure 20 is extracted from our earlier timeline of long stay faculty, from the year 17 up to year 30. Three of the bars are colored red for the sake of discussion: Guckenheimer, Peitgen, and Todorov. And this is my understanding of the troubling time.

Guckenheimer was unpopular with some colleagues for diverse reasons. A position had been created and Peitgen, who practiced computational math, had applied. A rumor circulated that if Peitgen were appointed, Guckenheimer, who really wanted a pure mathematician, would resign. Some people who did not like Guckenheimer voted for Peitgen, even though they might not like him either, in hopes that Guckenheimer would be driven away. For them, the negative charge on Guckenheimer was more powerful than that on Peitgen. I call this negative voting. In fact, Peitgen was
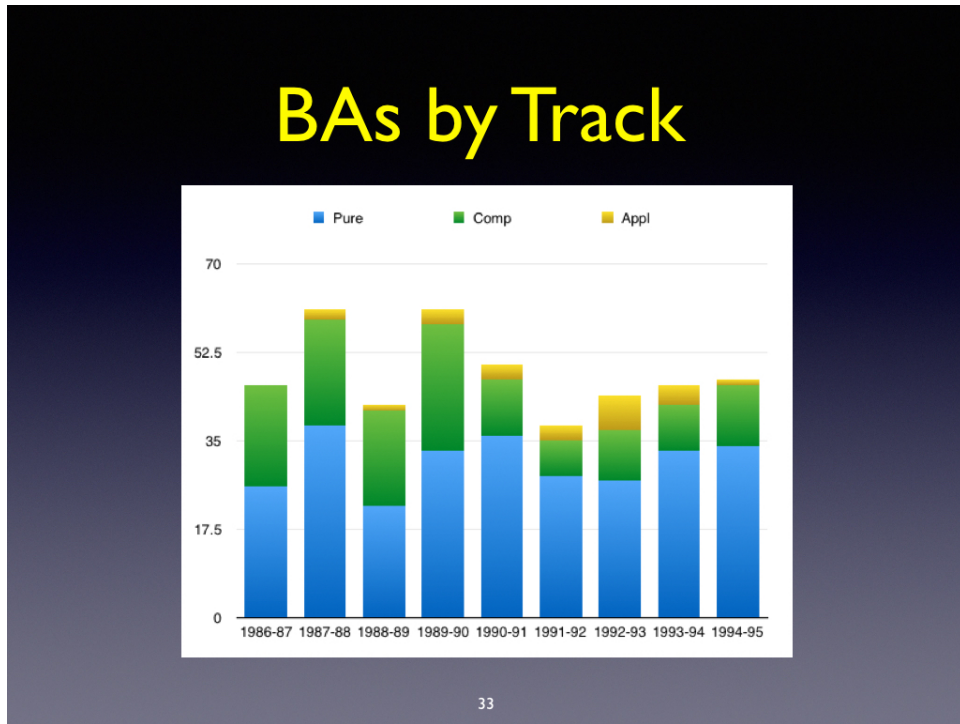
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Figure 19: BAs by track over the years.

chosen and Guckenheimer left.

This dynamic repeated with the next recruitment, for which Todorov, a pure math person, applied. There was a big controversy about his appointment. A group of four (Burgoyne, Greenberg, Peitgen, and myself) was opposed to the tenure offer to Todorov. Other than these, I do not actually know how my colleagues voted, but I always assumed it was unanimous. In any case, some of the positive votes were sincere, while some others certainly were negative. That is, some people who did not want Peitgen, or computational math, voted for Todorov, in hopes Peitgen would resign.

In the event, Todorov was appointed, and all four who opposed him left. Three retired by VERIP, but Peitgen who had not been around long enough to justify an early retirement, simply resigned.

So the red in Figure 20 highlights my theory of the demise of the math department. The net result, Guckenheimer replaced by Todorov, turned out to be a disaster, and the computational math program was destroyed by the departures of Peitgen, Kelley, and me.

Table 1

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95
Al Kelley														
Ed Landesman														
Nick Burgoyne														
Marvin Greenberg														
Gerhard Ringel														
Harold Widom														
Ralph Abraham														
Tony Tromba														
Arthur Fischer														
John Guckenheimer														
Geoff Mason														
Bruce Cooperstein														
Heinz-Otto Peitgen														
Sol Friedberg														
Andrey Todorov														

1

Figure 20: Histomap of the demise.

5   Conclusion

This is my memory of the first years, from the beginning in the Fall of 1965, year 1, through the demise in the Spring of 1994, ending year 29. After the demise, from year 30, a new math department was formed. It may be happier now than the pioneer group, but I am sorry that the computational program was largely lost.