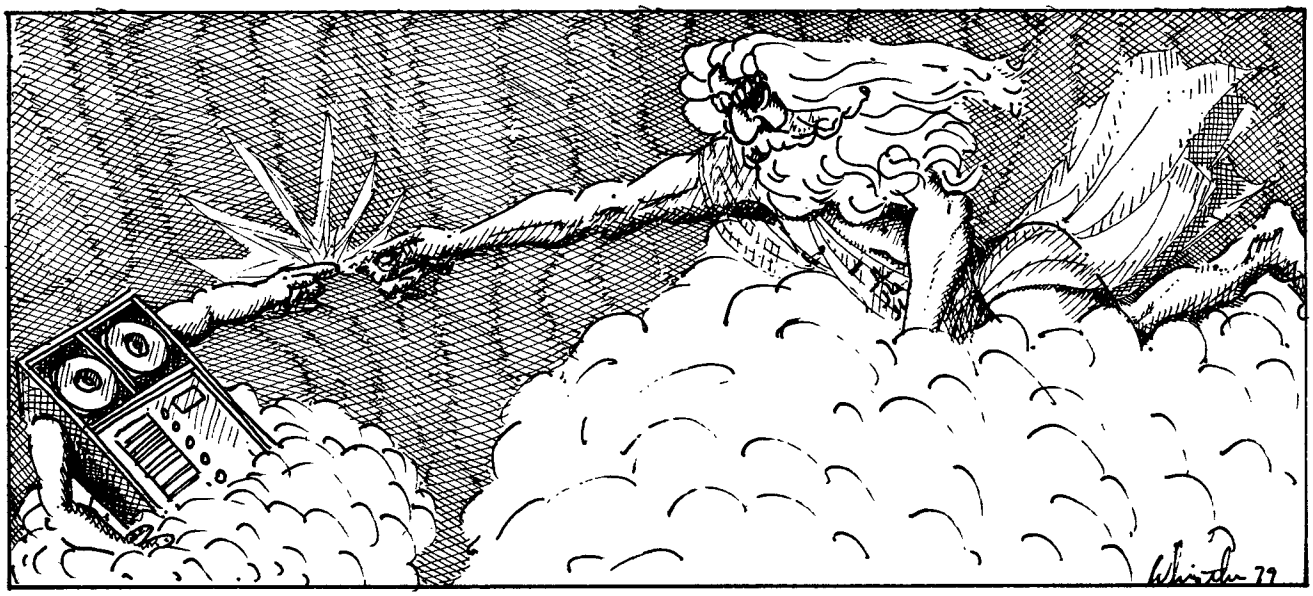

Renaissance Rensselaer

By James L. Moss

"For the purpose of instructing persons, who may choose to apply themselves, in the application of science to the common purposes of life".

For this, Stephen VanRensselaer, patroon of 400,000 acres in upstate New York, founded Rensselaer Polytechnic Institute in 1824. There was already an army school, a bit further south on a western point on the Hudson, which was developing military and civil (civilian) engineers, but there was no private school specifically dedicated to "qualify teachers for instructing the sons and daughters of farmers and mechanics... who will be highly useful to the community in the diffusion of a very useful kind of knowledge with its application to the business of living."

From a very shaky beginning, RPI has continued to grow at a slow and controlled rate, resisting the pressures to become public or very large, or a "research factory". If this sounds a bit too smug and comfortable, perhaps it was, for while these policies preserved a uniquely academic environment, RPI did not continue to enhance the national and international reputation in science and technology which it had developed in the nineteenth century and maintained through World War II.

It became clear to some of the more perceptive alumni and Trustees in the late 1960's that an expensive private technological university must be aggressive in developing new academic programs, new research, imaginative faculty and better management techniques in order to re-establish a national and international reputation for excellence and to compete for outstanding students. The resultant transition, in the early 1970's, can best be referred to as predictably turbulent.

During this period there was recognition of the need for a major upgrade of many academic services, including the computing capability, which until 1974 was supported by an IBM 360/50 and a small, underpaid staff. During the transitional period, an IBM 360/67 was acquired. However, computing continued to be a source of frustration to users and a source of acrimony among faculty, students and administrators.

When the new President arrived at RPI in the summer of 1976, he had already established an international reputation as an outstanding technological manager. An RPI graduate, he returned with an overriding goal to help shape this private technological university to meet the social, scientific and technical needs of the future, primarily by producing graduates capable of contributing to future needs of the country. He was already aware that computing had been, traditionally, a problem on campus and he also was aware that a strong technological university must have strong, multifaceted computing support. He immediately formed a Computer Study Task Force, made up of selected faculty, staff and administrators, with direction to study and report on future computer needs in terms of university policy, hardware, physical facilities, staffing, and external and research use.

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There were no specific fiscal constraints, but, rather, a requirement to provide a long-range plan to meet campus computing needs, suggesting alternative solutions at alternative costs. The President appointed himself Chairman of the Task Force and attended many of the meetings. The Task Force was established in September 1976 with a directive to have alternatives developed for presentation to the Board of Trustees in May 1977.

The Task Force first determined requirements by having subcommittees consisting of interested faculty, staff, and students examine areas of serious concern, such as research needs, instructional needs, number-crunching, time-sharing, and state of technology. These subcommittee reports became the basis for a preliminary request for proposals which was sent to nineteen vendors. The bidder's list was developed from equipment manufacturers, third party suppliers, facilities management firms, time-sharing organizations, and other universities. The preliminary responses were received in early December 1976, and seven vendors were selected to make half-day presentations to the Computer Study Task Force and other interested persons from the campus. Five vendors, all equipment manufacturers, were invited to respond to a final request for proposals and four--Amdahl, Control Data, IBM and Univac--did so. They were encouraged to provide multiple levels or alternative responses. In total, ten alternatives were considered, eight as proposed by individual vendors, one involving the procurement of a used IBM 370/168, and one involving a mixed combination of a dual DEC-10 and CDC 173. The latter two alternatives were added by the Computer Study Task Force because they appeared to be viable alternatives, not specifically suggested by any single bidder.

With the announcement of the IBM 30xx series, it appeared advantageous to permit all vendors to modify their bids, in view of the significant price/performance improvements which resulted.

Although RPI requires competitive procurement of major acquisitions, as a private university it has more flexibility than many public institutions. This flexibility frequently results in significant concessions on the part of vendors as the final decision time approaches. This circumstance resulted in considerable reductions in life cycle costs for the systems being considered.

The evaluation process for final selection was similar to the method used in determining requirements. Subcommittees were appointed to evaluate specific areas: Benchmarks, Operating Systems, Academic Support, Technology Assessment, Number-Crunching, User Evaluation, Administrative Services, Time-Sharing and Cost. In addition, site visit subcommittees visited other major universities using computer equipment and software proposed by the vendors. Without exception, the universities visited were most helpful in providing information on the strengths and weaknesses of software and hardware being used.

Subcommittees were comprised of faculty, staff, student, and some members of the Computer Study Task Force. Presentations and written reports were made by each subcommittee to all members of the Task Force. A standardized written report of all visits to other sites was also distributed.

Specific comments on three of the areas are appropriate. The benchmarking was based on a selected mix of more than two hundred jobs, and six scripts of increasing complexity for time-sharing. A great deal of time and effort were required to estimate job mixes, collect useful sample jobs (more than 700 were considered in arriving at the 207 job mix), work with vendors for comparability, and analyze the hundreds of pounds of output returned by the vendors. The benchmarks did provide sufficiently useful information to make reasonable estimates of the comparative throughput capabilities of competing systems. Subsequent data indicate that the throughput projections were reasonably accurate.

The time-sharing subcommittee acquired a signon and basic documentation from each of the finalists. A terminal room was set up so that members of the subcommittee could dial in and use the various systems. The intent, in part, was to approximate the circumstances of a freshman, signing on the system, using elementary documentation to learn the system. This was a very effective technique which highlighted significant differences in the strengths and weaknesses of the various time-sharing software proposed by the vendors. The overwhelming conclusion of this subcommittee was that Michigan Terminal System(MTS) software was clearly much better for the needs of RPI than any of the alternatives proposed by the vendors.

Distributed computing was an enigma. Everyone talked about it and recommended it as a way of the future. However, each person had a different personal definition of what it meant. The conclusion at that time seemed that there were no turnkey distributed systems available to meet our needs, but that the campus network development for distributed computing was essential for long range growth.

The reports of all subcommittees were reviewed carefully by members of the

Computer Study Task Force. The most important end product was a long-range computing plan, with specific recommendations concerning policies, funding, hardware, software, staff, and physical facilities for computing. The plan was consistent with the long-range goals of the university, and provided the level of computing required to support the academic, research, and administrative programs of RPI. With respect to hardware, an evaluation procedure using weighted, unweighted, and paired preference techniques was used to arrive at a consensus. The conclusions were that either an IBM 3033 or an AMDAHL V6-II were equally suitable to meet the long-range (7 year) needs of RPI, with the IBM 3033 having a slight life cycle cost advantage at that time. The alternate 5-year solution was that an IBM 370/168 or a CDC 173/174 were preferred, with the IBM 370/168 having a slight cost advantage. There were no sharp divisions of opinions within the Computer Study Task Force and there was general acceptance on the campus that the process had been thorough and fairly conducted, without favoring any vendor, and that there had been adequate opportunity for a large segment of the campus community to participate in the decision.

The Board of Trustees reviewed the plan and the following actions were approved:

a. Procurement of an IBM 3033.

b. Development of a campus network to support 180 open-use terminals, with an equal number for research, faculty and administrative use. (180 terminals would provide each student one 30 minute terminal session per day.)

c. Renovation of an existing building to provide a new computer center.

d. Staff increases necessary to provide quality service.

e. Implementation of policies as recommended by the Task Force.

f. Funding to support necessary peripheral upgrades as use increased over a five-year period.

The total cost of these actions was estimated at approximately seven million dollars.

In the two years since these recommendations were approved, the program has been proceeding according to the plan, and the nature of computing at RPI has changed in a very dramatic way. The IBM 3033 was installed in July 1978. Virtually all of the 5500 students at RPI use the computer. The number of time-sharing sessions has increased from one thousand per month to 50 thousand per month. After long and painful recruiting efforts, the academic services branch has increased from 4 to 12, and systems programming, including networking, has increased from 4 to 9. They are actively involved in developing a campus network system. The quality of documentation and consulting has improved accordingly. Funding for annual operating costs and capital procurements has been provided and income from research and other external sources is ahead of the plan. The renovation for the computing center is nearly complete, with occupancy planned for July 1979. It will be a featured building in the center of the campus which will be unique: functionally designed for users, but also effective restoration and reutilization of a beautiful building.

Progress has been made in other computer-related areas:

The Engineering School has operational a most advanced interactive graphics laboratory with dual PRIME 500's supporting 36 IMLAC refresh terminals. The graphics laboratory is being used by 18 courses with a total enrollment of 2,000 students. It is quite clear that the visual presentation of data and the ability to change, recompute and redisplay data in a matter of seconds is vastly superior to reviewing traditional alphanumeric output. This interactive graphics complex cost about one and one-half million dollars.

Administrative packages for new financial accounting systems, a new student records system, and a new alumni system have been, or are being, implemented. These and other administrative systems have involved expenditures of approximately $500,000.

Conclusions to be drawn with respect to computing are obvious:

A. Top management commitment and participation is essential in obtaining the cooperation of the varied elements on campus and arriving at decisions acceptable to these various groups.

B. The computing function is integral to the overall goals and objectives of the university. A computing plan is essential for systematic improvement. However, the plan should be consistent with the financial, academic and administrative needs of the university.

C. There are no free lunches, or at least we couldn't find one. Computing costs money, and, if the resource is available, the growth in usage is inevitable. Computing is an essential ingredient of the college educational process and we saw no

alternative to spending the money necessary to provide adequate computing. While research, and other external sources, may pay a pro rata share of computing expenses, the major costs of instructional and student use must be paid for as normal university operating costs. Those very few universities which are able to get a free ride, with respect to computing costs, are very fortunate, indeed.

D. The computing center staff must be highly professional and able to relate to the needs of student, faculty, research, and administrative users. In society today, highly professional computing people cost a lot of money, and universities must be willing to compete in the job market. In computing, a few good people can accomplish more than a lot of mediocre people. (In fact, in computing, just a few mediocre people are much preferred to a lot of mediocre people.) Judicious use of available salary dollars, even when it involves reduction in the total number of positions, may be the best way to improve the level of computing services on many college campuses.

E. Computing needs on a campus are diverse. It is unlikely that a simple single answer will meet all needs. Different types of computing, software and hardware, have a place in education. They should be considered complementary. The computer center has no more right to control which computers are on campus than the library has the right to control which books are on campus. The responsibility of the computer center is to provide computing service and, where appropriate, assist others on campus in the selection of minis, terminals, packages or other appropriate computing services. Avoiding undue waste, duplication, and misuse of computing are management responsibilities, which may involve recommendations from computing professionals on campus. However, there is every reason to believe that many types of computers, from very small to very large, will have a place on university campuses for many years to come. The challenge is to make the use of all these resources complementary and meet all the diverse needs for computing in the most cost-effective way.

F. Pictorial display computer-based techniques, such as plotting and interactive graphics, and techniques which save student, faculty or staff time, such as time-sharing and word-processing, are extremely popular with members of the campus community. The demand for these types of computing support can be expected to grow dramatically in the next few years.

G. We do not believe there are absolutes in meeting computing needs at a university. A solution which is well-received on one campus may be totally inappropriate at another. Similarly, we see no permanent solutions, in that computing needs will continue to grow and to change. We must provide new solutions in terms of hardware, software, staff, policies, and physical facilities in order to meet the changing circumstances of a dynamic technology. Unfortunately, these changes will also require continuing financial support.

Your SIGUCC Editor, Rita Saltz, called this the "RPI rags to riches" story when she asked me to write an article. As a former SIGUCC Editor, I know how hard it is to get articles for publication so I couldn't say no. (Can anybody say no to Rita?) (Editor's Note: Yes.) I prefer the title "Renaissance Rensselaer" to emphasize the point that the computer upgrade was only an essential, early item among many changes in curricula, faculty, organization, administration, physical facilities, research, and all of the other elements necessary to make RPI an outstanding private technological educational institution.

With respect to computing we don't feel as if we are up among the rich kids, although perhaps we have shed our rags. We are still two or three years away from chewing up what we have bitten off, and certainly we have our day to day problems. However, those universities that do qualify as computing "rich kids", might consider the words of that master of the vectored spheroids, Satchel Paige: "Never look back, something might be gaining on you."