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The Newsletter of the Research Resources Center

The following article is the second of a two-part history of the RRC written by Dr. Robert Loizzi prior to his retirement in December 1998. The first part appeared in the previous newsletter (Winter, 1999).

Challenging Years: 1970s and 1980s

In the early 1970s, as the RRC was entering its second quarter century, several changes were taking place locally and nationally which would affect the RRC in particular and academic research in general. First, the exciting, early years of the Aeromed Lab, fueled and focused by the fever of space exploration and the government funding it attracted, had passed. So too was its early role as a research catalyst for the campus and its governing board of university VIPs. New faculty with proven grant funding records were being recruited who had the ability to attract not only RO1 grants but equipment grants as well. During its first 25 years the RRC, through its support from the state and federal funding for the aerospace research projects, had supplied major research resources for faculty to use. Now, the conduit of research support was shifting to individual investigators. Moreover, the increasing success in obtaining federal funds prompted greater reliance on it and less expectation on receiving state funds for research, contributing to a static period of state support for centralized instrument facilities. This was exacerbated by the university's annual budget reallocation policy beginning in the 1980s in which all units essentially gave back a portion of their budget each year. Administrative units like the RRC reallocated twice the percentage of academic units. Those administrative units with an income from services could make up the loss using that source. However, without service fees, the RRC had virtually no flexibility to cope with this annual and progressive crisis. Conversely, increased federal funding during the 1970s resulted in a proliferation of major instruments such as electron microscopes distributed among colleges and departments all requiring and competing for campus support. The growing competition for grants resulted in a constantly changing slate of players to be consulted requiring research instrument needs. Sometimes, due to the long time span between identifying the equipment, obtaining funding and actual installation, the original, requesting faculty member(s) had entered a non-funded hiatus.

Secondly, instrument-related research was changing in many areas. For example, while the number of EMs multiplied, the novelty of electron microscopy for purely structural studies was waning among biologists as investigators and granting agencies believed that all had been seen that could be seen by this technique. Although this trend would reverse itself in a few years as biologists turned their attention from straight ultrastructure to cell and molecular function and combined EM with other types of microscopy, usage of the instruments in the 1970s was dropping to low levels. Some of this drop, however, was offset by the growing numbers of physical scientists, especially materials scientists, and engineers, who were increasingly using EM alone and combined with analytic methods such as X-ray analysis. Physiological and pharmacological research had moved from its high dependency on the use of dogs and cats as experimental animals, which usually required an wide array of shop-made equipment, to a preference for small animals and tissue culture, and bench top methods such as immunochemistry and molecular biology. This shift, plus the increasing pressure to produce data for publications and grants, resulted in fewer faculty investigators and, hence, fewer graduate students, wanting to invest months or years becoming proficient, hands-on users of high tech instrumentation.

Third, society's mandate in the 1960's for more (i.e., a doubling of) physicians and other health professionals, and the government providing capitation funds for this purpose, had set many universities through the 1970s on a course of developing more efficient educational programs in the health sciences and expanded classes. Often this mobilized effort and concentration of time and resources on education seemed to be accompanied by a de-emphasis on developing and maintaining competitive research programs.

Finally, the RRC was still committed to the philosophy of its earlier, Aeromed Lab days of charging no fees and providing access and training but not services. The reasons for this were, first, a deep sense of responsibility in the RRC to support research and graduate education; and, second, since granting agencies frowned on charging internal users differential rates (resulting in funded users subsidizing non-funded users) there was a reluctance to charge uniform fees which would cut off critical services from some active researchers who were temporarily without support. But in an era of proliferating grants, this policy was increasingly viewed, not as stimulating research productivity and excellence, but as subsidizing all research indiscriminately, without regard to quality or probability of funding. Further, the changing research picture and economics gave observers the impression that the RRC catered primarily to non-funded investigators and, in fact, enabled them to continue in this state. In truth, most non-funded investigators were appropriately using the RRC either to acquire preliminary data for their next grant applications and/or to support their graduate advisees' thesis research. Thus, the RRC was caught between a system growing increasingly cool toward this free "perk" for researchers and the demands by some investigators that the no-fee policy continue and that the RRC supply newer instruments and in greater numbers. Added to this public image albatross was an increasingly obsolete inventory of instrumentation which the RRC, lacking user fee income, was unable to pay for upgrades or leverage matching funds for new equipment as did centralized facilities at other institutions. This situation, had not changed much by 1986 when I moved from Physiology and Biophysics to the RRC as Assistant Director and contrasted sharply with my first recollections of the RRC via the EM facility 20 years before.

Coping with the changes.

In 1977 and following a two-year appointment as Associate Dean of the Graduate College, Sam Marotta returned to the RRC as Associate Director under Marbarger. Following the latter's retirement in 1980, he would become the second RRC Director until his retirement in 1994 and his main task would be to lead the RRC in the face of the above changes and challenges. Probably the greatest strength of the RRC during this period was the personal trust many faculty and administrators had in Marotta, his integrity and his word. Internally, he exerted a tight control over most RRC decisions as well as all expenditures. He repeatedly worked out ways and cut through difficulties to make certain the research needs of faculty and those of their graduate students were met. Marotta's contribution was his administrative ability to organize RRC facilities and expertise into a formalized structure, flexible enough to respond both to the research needs of investigators and to opportunities for acquiring needed instrumentation when they appeared. Thus, when departments wished to "donate" equipment to the RRC (i.e., to be supported and managed by the RRC), such as the first electron microscope acquisition 25 years earlier, Marotta would determine if there was sufficient faculty need to justify the addition as a core facility. If yes, space would be found, the RRC would ensure that all service needs were provided (e.g., electrical power, chilling water, air conditioning and humidity, anti-vibration, lighting, etc.) and the equipment was installed by or under the direction of RRC engineers. If expertise for operation of the instrument did not already exist in the RRC, funding was found and an academic professional would be recruited. Often this involved some cannibalizing of the RRC budget to move positions. Similarly, when a faculty member was willing to apply for an equipment grant, Marotta would assist in a variety of ways. There was an open and effective partnership between the RRC and groups of faculty members with a common technical need. The latter provided their credentials of expertise in a given technical area and a record of external funding awards while the RRC contributed its expertise in everything from helping draw up instrument specifications, negotiating favorable deals from vendors, space, installation, maintenance of instruments, and management of the facility.

Thus, despite the challenges described above, new facilities, upgrades and improvements and several pieces of research equipment were added during Marotta's tenure. For example, in 1988 an arrangement was made with Dr. Michael Johnson from Pharmacy, who had been awarded an equipment grant for a 500 MHz GE Omega NMR. The RRC would house, maintain and manage the instrument and Johnson would have access to it 25% time in exchange for access by other users on campus via the RRC-managed time under the direction of Dr. Robert Kleps. That instrument, the first on campus useful for protein and other macromolecular work, was completely upgraded last year as a Bruker instrument. In another cooperative endeavor, Marotta and the RRC

were asked to participate in planning conversion of the old Aeromedical Laboratory building into the Magnetic Resonance Center. It would house a large instrument in the lower level for human, clinical use, and a smaller Chemical Shift Imager NMR upstairs for non-clinical, research use. Following completion of the building and installation of the instruments under RRC direction, responsibility for operating the CSI was assigned to the RRC. For the next two years, Marotta and Rob Kleps worked closely with MRI users on campus, established a routine for using the CSI, supported its voracious appetite for liquid gases, and maintained its operation according to specifications. When during recruiting for a director of MR Center, authority over the CSI became a contested issue, the RRC relinquished all responsibility for the CSI to the College of Medicine and the director of the MR Center. Meanwhile, two critical years of experimental MRI research at UIC had been facilitated by the RRC.

In the mid-1970's, years prior to the explosion of PCs on campus, the RRC had already made a number of computer and statistical support services available to UIC researchers and these were expanded under Marotta in the 1980s. He continued the Tumor Registry, a service started during Marbarger's tenure in which detailed tumor statistics from nine hospitals were stored and maintained on the RRC's PDP11/45 computer and made available for research purposes to authorized users. In the early 1980s the RRC turned over all of its computer work not related to instrumentation and statistics to the campus computer center and moved its computer operations from the BGRC to the lower level of MSA. Part of this transfer included receipt of the RRC's first DEC VAX 11/750 miniframe computer which was made modem-accessible to faculty from computers in their offices and homes and data processing went on 24 hours per day. The VAX was also linked to an increasing number of RRC instruments for immediate storage of acquired data. Norio Shioura and a succession of younger programmers provided the software applications and designed the hardware linkages and networking logic while Minu Patel designed programs for statistical analyses. The first of the techniques linked was the 180 MHz NMR which required the writing of transfer programs on both the instrument and the VAX. Much of this programming was done by Christopher Monley who is doing similar networking today but with fully computerized instruments, super fast computer work stations and digitized images. The 200 MHz NMR came with its own Levy software package which facilitated the linkage. Next attention was turned to the EMs. Bob Kulseth and Mike Mutaw set up systems and even built equipment for collecting EM images, either on-line from the JEOL 35C SEM or via a digital camera from prints or negatives. The acquired data was transferred to the VAX for storage and could be analyzed by users with RRC-generated software and statistical programs. Flow Cytometry was next and Shioura wrote a complete menu of analysis programs, including cell cycle/DNA, before programs were available on PCs. Eventually, VAX usage during the day became so heavy that the computer operations were slowed measurably. In an effort to speed up the process, the RRC purchased a second VAX 11/750 from a department which could no longer afford to pay for the service contracts. BIF, the computing group and others joined to combine the two VAXs together with a microVAX into a system in which the microVAX received incoming work and automatically shuttled it to the VAX with the appropriate programs. Marotta nurtured collaboration between Patel and Shioura to develop statistical analysis programs for the VAX which could be used to analyze data acquired outside the RRC. One product of this effort was a *Time Series Analysis* program for detecting and measuring periodicity in biological systems such as circadian rhythms and alteration of homeostatic regulation of physiological systems such as cardiac rate, body temperature, blood pressure. Shioura's graphics programs allowed visualization of the phenomena analyzed by Patel's statistical programs which was essential for publications and presentations. In addition, for a number of years the RRC subscribed to various gene bank services which supplied tapes of data from the literature with protein and DNA sequences along with search programs which could be used without charge. This continued until such information could be supplied on-line to users through their PCs.

In 1986 Marotta agreed to take over operation of a six-year old Coulter Flow Cytometer/ Cell Sorter from the Dept. of Microbiology and Immunology. Dr. Karen Hagen was recruited and built up the RRC Flow Cytometry Lab. The first cytometer was replaced in 1990 by a dual laser model with a dye laser feature and, in 1994, was joined by a fully computerized Elite model. In 1989, following successful award of an NIH grant from primarily Biochemistry faculty for an amino acid analyzer, peptide synthesizer, protein sequencer, and an

HPLC, Marotta succeeded in finding space and remodeling funds to create the Protein Sequencing Synthesis Laboratory. When the University did not supply the promised two protein chemist positions for the lab, Marotta utilized an unfilled mass spectrometrist position to hire a protein chemist, Dr. M. Assaf Steinscheider, as the PSSL's lab manager. Following retirement of the latter in May, 1996, operation of the protein lab was assumed by Dr. Ye-Kin Ho, from Biochemistry, and his lab manager, Dr. Bao-Shiang Lee. They initiated a wide variety of services for the renamed Protein Research Laboratory and won campus confidence, user by user. This success was sufficient to gain budgetary support via the RRC and oversight responsibility for management and operation of the unit was returned to the RRC. For many years Marotta had promised a Biochemist, Dr. Mary Sue Hanlon, that if she succeeded in obtaining funding for the Circular Dichroism Spectropolarimeter he would provide space and support for it. When she was finally able to purchase the instrument, it was installed in the protein laboratory where it is still in active use. Just prior to his retirement Marotta agreed to provide space for a macromolecular X-Ray diffractometer, especially useful for studying protein structure in crystals, for which Dr. Karl Volz, Microbiology and Immunology, was submitting an equipment grant. The grant was funded after Marotta's retirement and his replacement, Charlie Brown, fulfilled all of the space and support requirements which Marotta had promised.

In this manner and despite the changes described earlier, the RRC continued to meet users' needs and serve an impressive population of researchers at UIC. In FY1993, near the end of Marotta's tenure as Director, RRC usage reached a peak of 900 total users and 90,000 hours of total usage. He retired on April 30, 1994 and passed away less than two years later on March 1, 1996.

1995. First RRC presence on the east side
Since the 1970s, faculty from the east side of the campus, particularly from the department of Chemistry and college of Engineering, had been bringing samples to RRC facilities to do electron microscopy, mass spectroscopy and other work. In the winter and spring of 1995, director Charles Brown, with the support of VCR Jan Rocek and the campus administration, began remodeling 1500 sq. ft. of space in the northwest wing of the SES building transforming it from a food service and student carrel area into the first RRC facility on the east side of UIC, a Mass Spectrometry Laboratory, to house three MS instruments donated by the Amoco corporation. Within three years, the entire first floor of this wing would be transformed into a new, 12,000 sq. ft. facility, referred to as RRC-East, housing NMRs, mass spectrometers, electron microscopes (including high resolution and atomic resolution instruments) and a variety of other analytic instruments to serve the research needs primarily of the physical sciences and engineering. Funds to complete RRC-East as well as many of the other changes listed in the first paragraph of this article are coming from a significant increase in the RRC budget resulting from a proposal called: *Management of a Campus-Wide Research Resources Program. The Strategic Plan for the Research Resources Center*. The Plan was written by the RRC Executive Committee with a significant contribution from Dr. Taylor Bennett, who had been recently appointed to the new position of Associate Vice Chancellor for Research Resources in the Office of the Vice Chancellor for Research. Contributed suggestions by the RRC Staff were included, and the plan was incorporated into the University budget and approved at all levels. This budget increase, it could be argued, is the most significant funding event since the RRC was founded.

Core Facilities: Toward a rational campus policy
The logical need and case for centralized, core major equipment facilities on economic grounds is clear but it is easy to ignore in the heat of individual situations. Success in funding should not blur the "research community" aspect when it comes to bringing major instrumentation to UIC. There are compelling scientific as well as economic reasons why *acquisition* of instruments should include long range plans for *maintaining, supporting* and *efficiently utilizing* those instruments for at least ten years into the future. None of this need interfere with the campus mission to nurture cutting edge science. Nevertheless, "Biggest bang for the buck" might be restated "Bang with the widest impact for the longest duration." A lesson to be learned from the past is the need for long range, collegial planning to provide the latest, needed instrumentation and services, together with scheduled upgrades and replacements, to be able to do this in a timely manner when needed by campus investigators rather than a year or two or five later, and to manage it for maximum accessibility to investigators. This can be done if people are willing to share usage of such instruments as well as

the support expertise needed for their maintenance and operation. Some say that those working on the cutting edges of science need their own instrument. The experience of the RRC has been that those working on the cutting edges of science don't have time to manage instrumentation and would rather utilize the services of RRC professionals who can do it effectively the first time.

The people of the RRC

It has been said that the true resources of the Research Resources Center are the talented people in its various facilities - the technologists and technicians, academic professionals, engineers of various types, statistician, scientific computer programmers, and clerical staff - who provide training, services, assistance, emergency help, and consultation; who keep instruments operating up to specifications; who often work evenings and weekends simply because it's necessary. Dedicated, service-oriented, and personally invested in good science and education, most never see their name in print, or receive an acknowledgment. One finds in the RRC an unusual group of "helpers" whose goal it is to make someone else's research succeed as if it were their own and who work as professionals to make it happen. Throughout its fifty-year existence the RRC has undergone a dizzying array of personnel, instruments, techniques, locations, budgetary ups and downs, social changes, national research goals and crises, and campus policies. What has remained constant is the will of its staff, individually and collectively, to provide their considerable expertise for the advancement of science and education at UIC.

Apologies are made to those whose names and contributions were omitted, distorted or slighted in any way. What started as a short, historical essay grew rapidly as interesting material presented itself on each phase of the RRC's development and it was necessary, finally, to stop. Many thanks to those interviewed and who put flesh on the bones of the written records. For those who preferred greater emphasis on present activities, this exercise was meant to fill a void in the past and so focused on the RRC's historical roots and development. Soon enough, current achievements will become history and the topic of someone else's article.

The author, Dr. Robert F. Loizzi, Director, RRC-West, retired in December after 32 years at UIC. Bob writes, first, from the perspective of a user of the RRC for 20 years while a Professor of Physiology and Biophysics, and then as an RRC director for the past 12+ years.