Three Year Progress Report for the Department of Chemistry and Biochemistry
Submitted by: Zeev Rosenzweig, Professor and Chair on February 29, 2016

The Department of Chemistry and Biochemistry at UMBC is one of the most service heavy academic departments on campus. The Department serves almost 3000 UMBC undergraduate students each year who must take general and organic chemistry laboratory courses to satisfy their degree requirements. About 90, and 400 of these students are majors in chemistry and in biochemistry respectively. Given the nature of the field of chemistry and biochemistry, and the considerable risk in having young and inexperienced students dealing with hazardous chemicals on a daily basis, it is not a surprise that delivering high quality instruction, particularly to this large number of undergraduate students is one of the most important challenges for the Department. The Department consists of 19 full time research faculty, six full time instructors, 25 teaching assistants (graduate students), 10 learning assistants (Senior undergraduate students), and four adjunct faculty members who dedicate significant amount of their time to manage the challenge of delivering high quality academic instruction to UMBC students. The faculty and instructors are being assisted by the department's staff employees who also dedicate most of their effort to support undergraduate students' instruction.

As a research department, the 19 research faculty in the department are constantly looking to build and maintain their research programs. Attracting federal funding to sustain the research programs has gotten more and more difficult in recent years with declining federal resources and scarce university investments in the infrastructure necessary to compete for federal funding in the current funding environment in the US. And yet, faculty members in the Department have been able to obtain an average of about $8,000,000/yr in the last three years to support their research programs. The Department has 45 graduate students at this time of which 25 are supported by teaching assistantships and 20 are supported by research assistantships and graduate fellowships. The Department is in the midst of a replacement cycle which poses another important and significant challenge. Since 2010, the department lost six faculty members for various reasons including retirement, death, promotion to the university administration, and failure to obtain tenure. The Department was able to replace five of them by hiring new faculty members, all but one at the Assistant Professor but this process has been very costly. It dwindled, almost eliminated, departmental saving accounts (DRIF, Foundation, Development) in order to provide the new faculty with the resources necessary to build their new research programs. To be competitive a startup package for most new chemistry and biochemistry new faculty exceeds $550,000, and in many cases even more resources are required to compete for top talent. And yet, the Department was able to attract excellent Assistant professors who are slowly but surely advancing their research programs to national and international prominence.

The seven year review of the Department of Chemistry and Biochemistry, which was held in 2013 raised a number of concerns in several areas including leadership, growth plan, faculty hires, research climate, advanced courses and staffing. The Department has worked diligently during the last three years to address these concerns and improve its national standing in the areas of scholarship, teaching, and service to the university and community. This report only address the concerns raised in the 2013 comprehensive report.

Leadership –In response to the concerns about leadership that were raised in the 2013 report, the Department decided to recruit a Department Chair from outside UMBC. A National search was

conducted and current Department Chair, Professor Zeev Rosenzweig was hired and assumed the position and its responsibilities on January 2014. Dr. Rosenzweig came to UMBC with 19 years of academic and administrative experience. He was a faculty member in the Department of Chemistry of the University of New Orleans between 1995 and 2005 where he rose through the academic ranks to the level of Full Professor. He then worked for nine years as Program Director in the Division of Chemistry of the National Science Foundation. Since joining UMBC in 2014, Professor Rosenzweig has established a highly successful and well-funded research program in the area of nanomaterials chemistry and has brought to UMBC two new summer undergraduate research programs.

Growth plan – Given the current budget environment, the Department does not have the resources to grow its faculty and is focusing instead on replacing faculty who are about to retire with new faculty members. The Department is using these faculty replacements opportunities to enhance its research capabilities along the chemistry-biology interface, and to diversify the portfolio of research directions by bringing new expertise in materials chemistry, particularly in the area of nanomaterials. There is space in the Meyerhoff building to accommodate at least two additional research faculty and the Department is developing a long term plan to add expertise in additional areas at the forefront of chemistry and biochemistry should resources become available.

Faculty Hires – Two new Assistant Professors were hired since the 2013 report. Prof. Mark Allen is an inorganic chemist who is working in the area of energy storage. He is using novel bioinspired materials to enhance battery performance. His work could have a major economic impact in the field of consumer electronics, particularly mobile devices where battery lifetime is a significant bottle neck. Prof. Minjoung Kyoung is a bioanalytical chemist who is designing, and constructing microscopy systems with single molecule detection capability with unparalleled temporal and spatial resolution. There are only a handful laboratories in the world with the microscopy capabilities she is developing. Dr. Kyoung plans to utilize these systems to investigate important cellular processes at the single molecule level. Her research will improve our understanding of the chemistry of living cells, and potentially lead to the development of new therapies to various metabolic diseases and neurological disorders. The Department is currently in the midst of another faculty search in the area of chemical biology, and we hope to complete the search successfully by the time this report is reviewed.

Research Climate – The research climate in the Department greatly improved. The rate of proposal submissions to federal agencies, mainly NSF and NIH has increased by 2-fold since 2014. The increased rate of proposal submission has led as expected to an increase in the number of major research grants that were awarded by NSF and NIH to faculty members in the Department. A departmental mentoring program to Assistant Professors, and an optional internal review of proposals for all faculty, were implemented. As a results of these changes faculty members who have not submitted proposals to federal agencies for many years have done so. The Department Chair is reporting in each faculty meeting the number of research proposals that are submitted to federal agencies and continues to stress that any investment of the Department in a research program of a faculty member must result in increased proposal submission activity. Faculty members in the Department continue to publish research papers, reviews, and book chapters in leading journals in the field. The Department has set goal that each graduate student will publish at least two research papers in top quality journals before they graduate. Since 2013 three faculty members were promoted to from Assistant Professor to Associate Professor with tenure. Prof. Marie Christine Daniel Onuta developed a highly successful research

program which aims to incorporate nanotechnology solutions into the field of drug delivery. Her research has been supported by a UMB-UMBC grant and by the National Science Foundation. Prof. Elsa Garcin developed a highly successful research program in the area of protein crystallography. Her research has been supported by the national Science Foundation and the American Heart Association. Prof. Marcin Ptaszek developed a highly successful research program in the area of molecular luminescent probes. Prof. Ptaszek is developing unique synthetic approaches to control the spectral properties of a new generation of molecular probes that are used effectively in bioimaging and laser guided surgery applications. Prof. Ptaszek's research has been supported by NSF and NIH.

Advanced Courses – the Department addressed the concerns raised in the 2013 report by developing a number of new graduate level courses in analytical chemistry, inorganic chemistry, and biochemistry. These courses were reviewed and approved by the Graduate Council. In addition, the Department updated a number of 400 level undergraduate courses to include a graduate (600) components, and to include new material which is now required by the American Chemical Society, for example in polymer chemistry. The Department has moved several courses, for example the advanced inorganic chemistry laboratory from the Fall to the Spring semester in order to increase enrollment, and in general stepped up its efforts to increase enrollment of science and engineering students in advanced courses to increase their viability in terms of student enrollment. Finally, the department added an ethics component to our graduate seminar course.

Staff members – The department was affected by the establishment of the Shared Services Center in the College of Natural and Mathematical Sciences and by the recent retirement of a long serving staff employee. The significant reaction in staff did affect operations in the department, mainly due to the lack of redundancy. It became more difficult to cover for absences of staff employees. The department is overcoming this difficulty by employing work students.

Summary

Like many other academic departments in US research universities, the Department of Chemistry and Biochemistry is fighting to maintain high quality research and education programs to UMBC undergraduate and graduate students in an era of shrinking resources. The Department faces a number of important challenges during the next three years leading to the next seven-year review. First, the Department must continue to shore its finances and increase its levels of savings. Under the leadership of its new Chair, the Department was able to balance its operating budget by eliminating waste and by implementing a plan to use senior undergraduate students rather than the more expansive graduate teaching assistants when possible, without sacrificing the level of instruction, or the safety of our students. The Department will continue to identify and implement efficiency measures to keep a balanced budget. In addition, the Department will seek to form partnerships with local industry in order to implement industry supported educational programs to enhance our students' experience. The Department will continue its pedagogical efforts to enhance the undergraduate research experience. With the addition of new research programs of newly hired Assistant professors, the Department will increase undergraduate research opportunities it offers to UMBC students during the academic year. Undergraduate research experiences are imperative to competitive applications of UMBC students to professional and graduate schools and must be provided in a higher number in order to maintain the excellent reputation of the Department in preparing our students to medical and graduate schools in

chemistry, biochemistry and related fields. A recent NSF-REU (REU = Research Experience for Undergraduates) grant will enable us to offer undergraduate research experiences to non-UMBC students during the summer months in the next three years. This will improve our ability to attract a greater number of highly qualified students to our graduate program. The Department will continue and even enhance its efforts to obtain additional federal funding in the form of research grants, training grants, and graduate fellowships from federal funding agencies (this year's increase in NIH funding is good news in this regard). The Department will strive to increase its engagement with the community through partnerships with Baltimore area institutions. The establishment of a Mellon Foundation-supported consortium in the area of the interface between sciences and arts in partnership with researchers and conservators from Johns Hopkins University, and the Walters Art Museum in Baltimore is a promising example of departmental activities that aim to increase public engagement and visibility. Finally, in line with the UMBC mission and reputation the department will step up its efforts to provide educational opportunities to students from traditionally underserved populations, and to increase diversity among undergraduate students, graduate students, and faculty members in the Department.

We believe that it is justified to end this intermediate three-year report on an optimistic note. It is a not a secret that morale in the Department of Chemistry and Biochemistry was in need of improvement at the time of the last departmental review and even earlier. This was the main reason for the UMBC administration to seek new external leadership. With the hiring of a new Chair who is committed to the Department and UMBC's success, and the hiring of a number of new faculty at the Assistant professor level who brought to the Department a great deal of energy and fresh ideas, the Department has turned a corner and is now in a much improved shape than it was only three years ago. Assistant Professors who were hired five years ago have gone successfully through the rigorous UMBC process of tenure and promotion, and are now beginning to assume leadership roles in the Department. Five of our full time instructors were rewarded for their great effort and dedication to UMBC students by promoting them to the rank of Senior Lecturers. Associate Professor Marie Christine Daniel Onuta assumed a leadership role as a new Graduate Program Director. Associate Professor Elsa Garcin is serving as faculty Search Committee Chair this year. Assistant Professor Minjoung Kyoung is the seminar coordinator for the Department. Elevating young faculty, especially female faculty to leadership, as well as nominating female faculty for prestigious awards that they deserve positions has been a top priority for the new Chair. This last year, Professor Kathie Seley-Radtke was selected as a UMBC Presidential Research Professor. This is the first time for a female faculty in the Department to win this honor, and only the second time for a female faculty to win this honor in UMBC history. At this time, the Department is looking to enhance its accomplishments in research, teaching, and university and public service and to become a role model for other departments at UMBC.

Respectfully submitted:

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