**NYU WIRELESS Annual Industrial Affiliates Board Meeting**

Meeting Minutes

10th Floor 2 Metrotech Center

NYU Polytechnic School of Engineering

Brooklyn, NY

April 23, 2014

11am- 6:15 pm

**Participants:**

**Board members for each of the 10 Industrial Affiliate companies were in attendance. Several additional engineers attended the Channel Modeling Workshop held before the board meeting. NYU WIRELESS faculty members were also in attendance.**

**Minutes:**

The board meeting was called to order by Prof. Ted Rappaport at 11:05 am. He stated that this was the first in-person board meeting for NYU WIRELESS, and welcomed everyone to the annual meeting.

1. **The Year in Review:**

Everyone first introduced themselves, and then Prof. Rappaport gave a recap of the past year’s accomplishments. He covered the growth of NYU WIRELESS and the new School of Engineering in NYU, indicating the School of Engineering ranking has improved from 67th to 46th in two years. He highlighted Industrial Affiliates benefits, including the recruiting day held every January, the web-based resume site and publication site, and the propagation database, as well as the annual Brooklyn 5G Summit. Faculty and student accomplishments were then highlighted, and current in-force research projects were presented, showing that over $50 Million in research funding was currently being expended in the center. Prof. Rappaport suggested that the individual $100K/year membership fee was providing great leverage and value for each of the Industrial Affiliate companies, and that a deep relationship between NYU WIRELESS faculty and the board members was essential to help promote and ensure and the value proposition of NYU WIRELESS inside each affiliate’s company.

Data presented showed that NYU WIRELESS faculty members are currently advising 66 PhD students, 25 Masters students, 13 Undergraduates, and 3 MDs. 18 PhD students and 12 Masters students have graduated since the center’s founding in 2012. Some of our students are now working for Industrial Affiliate companies Qualcomm, Huawei, Nokia Solutions Networks, and Ericsson.

A review of the budget showed about $600,000 in annual expenses, including $250,000 in faculty distributions used to encourage teamwork within the center. [Ted, this makes it sound like the rest of this is admin overhead. Is that true?] Income from Industrial Affiliate memberships totaled about $1 Million for the year, with Samsung, L-3, and Qualcomm up for annual renewal in June 2014.

Lunch was served, and the Board enjoyed some social time with one another and with the faculty.

1. **Strategy and Goals**

Prof. Rappaport then presented strategy and goals, and asked the Board to ponder key questions regarding focus, direction, and strategy during the board-only portion of the meeting. Goals for NYU WIRELESS were broadly classified into five categories: a) to improve incoming student quality, b) increase faculty research productivity and relevance to the Industry Affiliates, c) grow the number of Industrial Affiliate companies, d) increase collaboration among the faculty members and students, and e) make NYU Wireless more relevant to the Industrial Affiliate sponsors. Towards these goals, NYU’s School of Engineering has been embarking on a multi-pronged strategy to become one of the top 30 engineering schools in the USA. This strategy includes recruiting 10 new faculty members with proven records of accomplishments over the next several years. In addition, NYU WIRELESS and the ECE department have already committed to many new Ph.D. Fellowships. Incoming student quality was noticeably stronger over the past 2 years, but more work is needed to recruit better graduate students, and this will occur naturally as our engineering ranking continues to rise. The unique assets of NYU -- our urban location, our access to rooftops throughout Manhattan, and a world-class medical school and computer science/math department -- are all keys to increasing the School of Engineering ranking, and NYU WIRELESS is working to engage those assets to bring value to the Industrial Affiliate companies.

Faculty collaboration also needs to improve, as many NYU WIRELESS faculty members are still not fully engaged with the center, and this hurts our culture and the experience of the students. Prof. Rappaport asked the board for suggestions how to improve this, and stressed that Industry Affiliate companies should feel empowered to develop relationships with many faculty in the center, and to use all of the expertise on our faculty for their company’s benefit. He stated that our ultimate goal is to graduate our best students to take jobs inside Industrial Affiliate companies, and that all the faculty want to help our board members do this. The faculty are at the service of the Board.. [This last sentence may overstate the ability of the board members to control our time. Do you want to qualify at all.]

Prof. Rappaport then presented three potential steeples for excellence to meet the 5 stated goals above. These three potential steeples of excellence included: a) A National Science Foundation (NSF) Engineering Research Center (ERC) in GHz and THz wireless/optical systems and devices, b) White Spaces and Dynamic Spectrum Access, and c) Medical wireless applications. The board was asked to provide feedback and thoughts on the potential strategic value of these opportunities during their closed-door session.

1. **NSF ERC Opportunity**

Prof. Dennis Prather from Univ. of Delaware (UD) then presented the vision and team for an ERC proposal that unites faculty from UD, NYU WIRELESS, Univ. of Texas WNCG, and faculty from UC San Diego (Jim Buckwalter) and Univ. of VA (Joe Campbell). Prof. Prather explained that our NSF proposal had made the cut to the final 18, and that 3 to 4 awards would be made next year, based on proposals that will be due in the middle of June. The “I-Max Wireless” project being proposed by the UD, NYU, UT team would conduct research into mmWave circuits, systems, and adaptive antennas, as well as backhaul and security research. The ERC will have several testbeds aimed at creating massive broadband wireless systems and optically-fed adaptive antennas for use at mmWave frequencies.

The funding levels of the NSF ERC program are the highest of all NSF programs, and would bring about $5 Million of NSF funding per year, over a 10 year period, to the winning centers, thereby making them de facto national centers of excellence with a mandate to do pioneering research.

A key part of every ERC is an industrial affiliates program, and Prof. Prather proposed a $25K/year commitment for the new ERC, should it be funded. This amount would be in addition to the present $100K/year NYU WIRELESS Industrial Affiliates funding. Prof. Prather and Rappaport made the case that $25K/year would bring leverage of $5MM/year in research, making this hopefully a very easy sell inside each Industrial Affiliate company. Supporting letters will be due in late May, and we are dearly hoping that all NYU WIRELESS Industrial Affiliates will be willing to make a commitment, in the form of a commitment letter that will be submitted with the proposal, to show the NSF that major companies are willing to be affiliates to the new NSF ERC.

1. **Research Previews**

The newest professor to join NYU’s ECE dept., Davood Shahrjerdi, was introduced and welcomed to NYU WIRELESS, and he gave a brief talk about his research into flexible electronics, solar circuits, and nanoparticles. Dr. Shahrjerdi joins us from IBM T.J. Watson where he worked for 4 years as a research scientist. Davood received his Ph.D. from UT Austin in 2009. Drs. Bloom and O’Neill then gave presentations on wireless in the hospital of the future, and new wireless devices being used for acute care. Dr. Mary Sevick and Dr. Gbenga Ogedegbe provided updates on her work in behavioral healthcare and key facts about obesity and patient health monitoring at home using wireless devices. Undergraduate student George Wong gave a history of the mmWave propagation measurements and database development. Dr. Dan Sodickson spoke briefly about his work in MRI and the ability to measure RF radiation using MRI for heat analysis.

The board meeting then moved to the NYU WIRELESS research space, where an extensive coffee break and poster session was held. 36 student posters and demonstrations were on display, awards were planned for the top 6 posters, but the Board’s feedback was that there was not sufficient time to evaluate all 36 posters, and that the quantity of posters was simply overwhelming. We decided to award all students with a token award for presenting a poster.

1. **Board Recommendations**

The Board spent considerable time meeting alone, and provided valuable feedback to the NYU WIRELESS faculty. The board commented that some of our students simply were not good at delivering the key concepts of their research, and that interpersonal communication skills need to be improved. TU Dresden was cited as an exemplar for how students should be able to communicate technical concepts in poster sessions, and the faculty took this to heart. Also, the Board felt more time should be allocated for the poster session in subsequent years.

Regarding the focus of NYU WIRELESS, the Board was unanimous in stating that we should stick to our knitting, and must keep investing in our mmWave research activities, and build from our leadership base in this area. While medical research has potential, the Board pointed out that our current affiliates are device makers with extremely large markets, whereas medical companies are more vertically-integrated.

Paul DeLia of L3 suggested that we reach out to Latham and Watkins, a law-firm with interest in spectrum matters, as an example of an affiliate that is related to our leadership in mmWave wireless.

Until we have medical companies on the board and invested in the center, and until we have faculty expertise that can lead such medical work, the Board advised the faculty to not dilute our efforts, and to focus on the millimeter wave work.

In order to help justify NYU WIRELESS funding inside each company, and to help build a more collaborative research environment in the center, the Board urged the center to establish annual projects that could be approved by the Board in a very lightweight manner. These projects would be in areas of interest to the Industrial Affiliate companies, and could serve as the rallying point for collaborations in the center between faculty, students, and affiliates. These projects could also be the focal point of poster sessions at subsequent annual board meetings.

The Board left the project structure and size up to the center to decide, and deliberations are already ongoing among the faculty (we expect to have a formulated approach by May 31, 2014), but specified the NYU WIRELESS affiliates funding breakdown to have a 40/60 split, where 40% of NYU WIRELESS affiliates funds would go to overhead costs to run and staff the center and incentivize the leadership of the center, and 60% of the affiliates funds would go to projects that the Board would have interest in and approve.

Of the 60% of total revenue to be spent on projects, 70% of that amount would be on core projects, approved by the Board, and 30% would be free thought projects that could generate radical new ideas. The faculty agreed with this model, as it provides a means to build a more cohesive culture through the projects, while incentivizing faculty to be engaged with the center through “free thought’ research with some of the industry funding. This was viewed by all to be an excellent balance for continuing to add value while building our collaborative culture. This was a very positive outcome of our Board meeting. Affiliates also mentioned this would help justify the program internally, as now there would be projects that could be identified, followed, and could lead to deep engagement by Affiliate companies.

For the medical research area to expand and be relevant, the Board stressed the need to know what is “real” research and what is fundamentally valuable. This can be done only when leading medical faculty are deeply involved in driving research and cultivating relationships with new industry partners from the medical field.

The faculty thanked the Board for an excellent day, and Prof. Rappaport closed the meeting expressing his deepest gratitude for the time, energy, and ongoing commitment that all of the Board members have given to NYU WIRELESS.

The Board meeting was adjourned at 6:15 pm