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Panel Session: Information on Disabilities from the Perspectives of Graduate Students
A session of the CEOSE Mini-Symposium titled "Institutions Serving Persons with Disabilities in Science, Technology, Engineering, and Mathematics (STEM)"

Panel Session Facilitator: Dr. William C. McCarthy, CEOSE member and professor of Civil Engineering at New Mexico State University.

Speaker: Miss Nicole O'Connell is a graduate student in the Department of Biochemistry and Molecular Biophysics at Columbia University. She has a B.S. in physics and applied mathematics from the University of Rhode Island (URI), and she was an intern for IBM in 1999 and at NASA Goddard Space Flight Center in 2000.

Miss O'Connell: Thank you, Dr. Bill McCarthy for that introduction. I thank the NSF for its continued commitment and support of science and research particularly in terms of funding graduate students, especially me. As Bill said, I'm a graduate student at Columbia. I was diagnosed with attention deficit hyperactivity disorder (ADHD), but I actually had a very late diagnosis. I didn't know I had this condition until then. In terms of transitions, as I went from high school to undergraduate, I struggled pretty severely. In high school I wanted to do everything, including theater, student government, and other activities in addition to my studies. My day was very structured, and I always had my parents shuttling me around, as they often do when you're in high school. When I got to be an undergraduate student in college, I didn't have that supervision and direct support. The structure of the university classroom and the academic environment are very different. For example, you are only in class a few days each week instead of every day, and a lot of the requirements consists of reading on your own. Consequently, I just couldn't get it together. My grades were suffering, and that is actually when a friend of mine who also had ADHD recommended that I make an appointment with URI Disability Services, to which I will refer as DSS. I made the appointment, and I was given a list of places to go for diagnosis and a psychiatric testing. I got the diagnosis, and that really changed things for me.

I started a treatment on pharmaceuticals, including riddlin. What helped me the most is working closely with DSS through accommodations programs, and DSS had a lot of good workshops to help me develop my skills to be a better note taker and to get more out of the classroom lectures, and the like. So, the accommodations I got in undergraduate included note-taking. I also was allowed to record the lectures, which was very, very helpful. I was given a modified testing procedure since I never finished tests on time. I took the physics based GREs, and I finished question one hundred at the end the exact minute, time limit. So, I didn't have time to go back over the test. I have always had this problem. The modified testing procedure was helpful, and the DSS staff worked with me on skills development.

The other thing for which I credit DSS is introducing me to the Entry Point Program, which was pivotal in my academic career. In 1999, I participated in an internship at IBM, and in 2000, I participated in an internship at Goddard Space Flight Center. The value of these experiences is multi-fold. The first thing I learned at IBM was that I can program. However, for someone like me who has attention deficit disorder, it is easy to miss a semicolon and to have syntax problems. Finding small symbols like this was a real challenge for me. Where I did succeed at IBM was in the Electronics Department where I worked on electro-static discharge. When I was doing the hands-on work, I found my workday and time much more fulfilling. Similarly at NASA, I did a lot of data collection, but all of the data was pulled from a satellite. It wasn't hands on. I really found that I benefited from that. Because of these two experiences, I got to see two types of workplace environments. This was beneficial since you don't know what a job will be like just by completing the work for an academic degree. When you have the experience where you can get first-hand knowledge of what day-to-day life is like in the industry, it will really be pivotal in shaping your decision-making process. It helped me decide to change my major fields to biochemistry and molecular biophysics because of the hands-on element. With these experiences, I knew that I

really wanted to work in a laboratory and to have my day filled with many different activities—time on the computer and also in the wet laboratory and on other tasks. I just can't say enough about Entry Point. It's not just the experiences they give you; it is the fact that it is a real family. The people at Entry Point build a community where you learn so much about people of every range of disabilities, which just makes you so much more open-minded. I have turned into a super advocate, and that is great. I must thank you.

Now, I will talk about challenges. It is great that all of the items that I put into my outline have been commented on by previous speakers, and specifically, Bill talked about transitions. I think that is one of the major hurdles in securing one's academic future. As I said earlier, when I transferred from high school to undergraduate it was a huge transition and a big hurdle. At that time, I didn't have the mentorship support. I had to learn from a friend. I wasn't having the type of experiences that other people in the university were having—I was really struggling. Other students didn't know me from high school; they didn't know my capabilities. That transition was very tough, and my transition from undergraduate to graduate school was really tough too.

In applying to graduate school, I wrote in my application all about my disability, but I never brought it up again after arriving on campus. In graduate school, the student relationship is much like what was discussed earlier; it is a one-on-one type of situation. During the first year of graduate school, I did not have a support system. At Columbia University, courses plus three laboratory rotations were taken the first year. The course work and related activities were a lot like those at URI, except I didn't have the support services—the note takers. Most of the graduate courses were survey type, and that was exacerbated by the fact that I changed fields. I didn't know anything about biology or chemistry, there was no program to get me up-to-date. It was a very, very stressful year; I progressed by the skin of my teeth. At the end of that year, there were comprehensive exams to be completed, and I didn't get modified testing procedure. So, I was only able to finish two thirds of the exam. Hind sight being 20/20, I would have done things differently if the opportunity were available. Now that's over, and I can breathe a sigh of relief that I made it through.

As I was saying, the transition to graduate school was tough because of the balance I had to reach within the first year; now, it's just me. Graduate school is designed to help you transition from being a dependent student to being an independent scientist. Most of the work I do alone. When little mess ups occur, there is nobody there to catch you. When you're trying to troubleshoot something and you realize that you made a stupid mistake, it is really hard to deal with, but you just have to be patient. Take it one day at a time.

I wanted to talk about the specific challenges. At the last AAAS meeting, I met a wonderful young man who lost his sight in his senior year of college, and he was interested in biology. He wanted to pursue a graduate degree in biology. This brings in the whole wet laboratory situation. Since he couldn't see, I was trying to brainstorm with him about what accommodations he could get. We really just came up with nothing; we hit a brick wall. It is very labor intensive—we'll say that. That lack of support services creates a special challenge for people with disabilities in the biological and chemical sciences. Also, graduate school tends to be more practical learning and less learning from a classroom. That is another transition you have to learn in a different way. Also realize that I was personally in the laboratory (having ADHD) setting up a hundred reactions. In that situation, I may be rude or may seem so. Whenever somebody tries to talk to me when I'm doing my thing in the laboratory, they get the hand. I don't mean to be rude, but my signal is for that person to leave me alone until I finish what I am doing. If you mess up you have to start over again. Also, for graduate school, since I have a non-apparent disability, we were talking about disclosure and stuff. It's very important to speak up. I assumed that since I said this (told of my disability) on all of my application material, it was disclosed and that the principal investigators and the department people were going to remember that disclosure. Seemingly, they did not; therefore, you need to speak up; let them know about your disability. Tell them what you need, and you'll be more successful. Another personal challenge that I face now in graduate school, which I've faced my whole life, is I really have a hard time reading. So, I know that there

is assistive technology for the blind. If I were where you can get audio format text that would be advantageous. If I can be reading and hearing at the same time, I really do grasp the information a lot more. Now, I'm working closely with the Office of Disability Services at Columbia, which is an amazing office. Everybody with ADHD gets this accommodation, and everybody who is visually impaired gets that. They are very one-on-one. We are working to get a journal in audio format for me. The turnover time is hard. Somebody was saying there are 150 publishers in for all these journals. So, I guess the turnover rate is pretty high. It takes two to three weeks to get an article in audio format. Maybe someone should automatically have the journal published with audio content.

I just want to reiterate about my graduate career and the importance of speaking up. Recently, I stopped taking the medication; so, it is difficult for me to adjust especially for the reading. The reading was easier when I was on the medication. However, I'm glad not to be on it, now I'm using the new accommodations and resources to help me get through it all. So, that's basically it. Thank you so much for your time. I have a little bit more. I forgot I had a third page of information to share. For my recommendations to the committee: the audio journals definitely are a must. I don't know if it is possible, and probably it will be really expensive. For the people who can't do the wet laboratory work, I would like to see text sponsorship/funding for someone who can, and the disabled person could handle the data analyses that are less physically demanding. The technology is amazing, and there are tons of robotics for crystallography. They have machines that can do so much. I would like to see emphasis on the robotics to automate other laboratory experiments. Okay, now I'm done. I thank each of you for this opportunity to share my thoughts with you.

Speaker: Mr. Ron Painter is a graduate student in chemistry at Stanford University, and he earned his B.S. in chemical engineering at the University of Washington.

Mr. Painter: I thank you for the introduction and for receiving me. I was born deaf. I was born and raised near Seattle, Washington in the Northwest. I grew up signing. That was specifically my modality of communication. I entered elementary school. I had class with about 12 students, all deaf students, all the same. However, when I was in 4th grade, I was mainstreamed into a hearing classroom with a sign language interpreter like I have today. So, while growing up—same thing—I used interpreters in the hearing classroom. In middle school, high school, and college, I always wanted to be a scientist. I studied chemical engineering at the University of Washington, beginning in 2001. In 2004, I graduated from the University of Washington with a B.S. in chemical engineering. I thought, hmmm, I really want to major in something more scientific because I really like chemistry. So currently, I'm a fourth year student studying for a Ph.D. in chemistry at Stanford University. My experience at the University of Washington was that it was really wonderful in providing disability services for deaf people. I had great interpreters. I had somebody with me all the way through to graduation day.

When I moved to California for graduate studies at Stanford University, there was a big issue. The university services had interpreters from California who had never been exposed to chemistry. It was different from my experience at undergraduate school because the interpreter learned the vocabulary and concepts of the relevant subjects when I went there. Then I go to California, Stanford University! What did I do? We discussed it, brainstorming; we figured out what needed to be done. We (the interpreter and I) would get together now and then and discuss the chemistry vocabulary. My interpreter would take all of the notes, terms, and words that she had never heard before and would sit there with me and brainstorm with different signs. That really helped because it was helpful for the interpreter since she could then understand my signing for the chemistry. You have to understand that chemistry is not English; the chemistry I have had and am still having is not English. Does that make sense? Chemistry is very technical. It's a different language. So, the interpreter had to learn how to speak that kind of language and how to hear and express that kind of language. That was really tough that first year because I was in a graduate classroom, and it was completely different from undergraduate. The chemistry

comes at you fast. Before you realize it, the work is done, and you are gone. That's it; you talk about today's research tomorrow. There was a lot of work for the interpreter and a lot of work for me, but I had a regular interpreter. That was very important.

Things that came up—a couple of problems: Suppose the interpreter was gone or out for vacation or sick or something happened, and she was replaced with another interpreter that wasn't my everyday interpreter, one that didn't know the chemistry vocabulary. Then I would have a problem. I still have that problem, but I am trying to stick with my regular interpreter because I know that's very important for my communication needs. My needs for communication pertain to taking classes. I'm basically finished with all of my classes for the first year; that's done. The second and subsequent years are basically research. So now, I'm in research. I work in the laboratory in a group, consisting of about ten people. My boss, wow; he is wonderful; he really is. He cares about the communication; he focuses on the best ways to communicate, how to use the interpreter, how to sit, etc. I mean, it is great how fast the work and communication go. Now, compare this professor to another one who says he feels that the interpreter has to be there and that he don't want to insult the interpreter. Seemingly, he does not realize that he is talking to me. That's the kind of thing you have to get used to. My regular boss is great. That's wonderful.

The communication needs are difficult when you're working in a laboratory because, obviously, you can't really have the interpreter for full-time work. I mean that's very expensive for the Disability Services Center (DRC) at Stanford University, which is a small university of only about 7,000 undergraduate and about 8,000 graduate students compared to the University of Washington, which has 40,000 or more students. The small DRC means that there is a smaller disability student population, which means fewer available resources for me. So, I have to figure out how I'm going to communicate with my laboratory co-workers and peers and how to talk with them when they don't really want to sit down and write notes back and forth with me. When I write notes to them, they look at me like oh okay I guess I'll write. I know that they are not crazy about that. They really want oral communication, and I can't do that. That's still a challenge for me. That's a challenge I'm still facing. Suppose I need to know how to do one thing. I know this other person really is a pro at this one thing. So, I ask him, and he's not really open with different types of communication. So, it's really a sticky situation for me.

The third thing is that I teach; I'm a teaching assistant for six classes. In the quarter system, it is different from the semester. In a semester, you have the two 15-week periods. Then in the quarter system, you have three in a row of ten, ten, and ten weeks. Anyway, I am teaching six classes this quarter. I've taught what you call recitation. What happens is that I have an audience of students that ask me, as the teaching assistant, for help for discussions about course materials different from, but related to, what the teacher is saying. So far, I have had pretty good experiences with the students, and the students seem very okay. You're deaf, big deal; you use an interpreter. They accept it. That's the very positive aspect of the Stanford student population that I've also experienced. I've taught four times as a regular teaching assistant and twice as the head teaching assistant, which means that I was the administrator for the course. You know, the professor gives the lectures, and I would takeover making copies of course materials and discussing what we're going to do for the rest of the week. That has also been a positive experience for me, as well.

The last situation for me as a teaching assistant is as follows. I'm also a laboratory teaching assistant, and that's challenging. In the first year, each graduate student is required to be a teaching assistant for one laboratory. It didn't matter which laboratory, but each had to have one laboratory. So, the laboratory supervisor for all the laboratories at Stanford said to me: I don't know. You're deaf; suppose something terrible happens. What are you going to do? You're deaf; how are we going to communicate? So, I said okay, fine. I went to the laboratory professor, and I sat down one-to-one with him. I went over the different things—what things were important for the knowledge and what things are important for the laboratory courses. From that conversation, I remember two things, two big things. What if something glass breaks; say a person walks across the laboratory and drops a glass beaker and chemicals are spilled on the floor? What are

you going to do? Second of all, there is specific methodology that requires a vent every now and then without which a hazardous gas might increase and cause a little explosion. So, that too requires specific hearing and sounds. So, I said, fine, and the laboratory professor and I sat down together and had a discussion. We figured out what we were going to do. So, we decided that the interpreter would sit in on the classroom lectures and observe what was going on in the laboratory. They learned what to listen for in the laboratory and the classroom. Luckily for me, the teaching assistant for the laboratory, there was no terrible happening. Of course, glass broke several times, and somebody spilled something in the laboratory. Things like that happen, but nothing terrible happened. The interpreter was quick on getting my attention when necessary, and I talked with a student who was having problems in the laboratory. So, that worked out very well, and the whole situation has worked out well for me. So, those are really different scenarios where being a teacher is involved, and I had to experience those things.

Generally my experience with Stanford University has been very positive. Of course, communication needs are very important for me. That's really the only need that I have for me being deaf. I mean I'm in this position. I'm self assured and motivated. Communicating with people that are not willing to use pen and paper to communicate with me is still a problem.

Oh well, I have one additional story. When I was looking for a graduate school, I wrote down all the points about available services, as I visited a number of graduate schools. The first thing I was looking for in a graduate school was that it was a good fit for me as a deaf person. I also found out if they had good services for persons with disabilities. I visited one school for two days. This was a small school. My finding was that officials at this school, obviously, had never experienced hiring an interpreter. During this campus visit, I met with all of the different professors. This was an all day long activity. They talked about doing more research and about giving all the lectures and the hiring of one interpreter. One interpreter for the entire day! That's terrible because the volume of work will wear out the interpreter, especially in reference to courses that are as hard as chemistry. So, I looked at the professor and said: You hired one interpreter for all day. Apparently, you haven't had any experience with hiring interpreters. No, no thanks! With that I decided to say “no” to that college. Stanford seemed to have everything going for it, and that is why I picked that university.

So, in summary, my experience as a graduate chemistry major is very positive. I am very happy. If you have questions for me, I would be happy to answer them for you at the end of this panel session.

Speaker: Mr. Carey Supalo is a graduate student in chemistry education at Pennsylvania State University. He earned his M.S. in chemistry from Pennsylvania State University and his B.S. Degree in chemistry from Purdue University. He has been a member of the National Federation of the Blind since 1993.

Mr. Supalo: I wish everyone a good afternoon, and I thank Dr. McCarthy for the introduction. I want to start back in my high school days and go from there. So, when I was a junior in high school, I was asked to register for my senior year of classes, and one of the classes for which I wanted to register was calculus. Everyone has to take calculus in order to go into a STEM profession, and I wanted to do that in high school. Well, this created quite a stir among the faculty at my school because they had never taught that level of math to a student who was blind. So, we all got together—my parents, my guidance counselor, the head of my math department, my math teacher, several other people, and me. We discussed my taking calculus. It was decided that since they had never worked with a blind student in that kind of curriculum before and they did not know of any blind person who had taken calculus, they could not support me in taking the calculus course. They said they wouldn't prohibit it, but they wouldn't support me if I choose to go that route. As a result, I was pretty upset and didn't know what to think. Ultimately, I decided not to take the calculus class. After I left that meeting, I remember going back to my physics class. It's embarrassing, but I just started balling. My physics teacher came over to me

and asked me what was wrong. I said I just realized I'm going to be limited in what I'm able to achieve. He didn't know what to say to that. It was quite an eye opening experience to me, and I never had this happen to me in the past. So, I finished out my junior year and went into my senior year. In your senior year, you have to apply for college. I sat down with my guidance counselor and reviewed my interest inventory survey results. Interestingly, all of the survey results consisted of recommendations for me to be a scientist or engineer. I wanted to be an electrical engineer, that's what I wanted to be then. My guidance counselor said, well since you can't do calculus you can't be an engineer. Let's pick something else for you to be. How about psychology or social work—things of that sort? Through that discussion I settled on a major of business administration with a minor in psychology. I applied to school, and off to college I went.

During the summer between high school and college, I was introduced to an organization called the National Federation of the Blind, which was mentioned in my introduction. There I met thousands of employed blind people doing all kinds of wonderful things. I'll never forget that one of the very first presentations I heard was from a blind high school calculus teacher. I said to myself, if I can't take it, how could she be teaching it? Through that I came to the realization that I had to network with people and ask questions and figure out how these people got to where they were. I learned about Braille, Braille books, developing skills with the long white cane, the possibly of getting a dog guide, and things of that sort. Through my transition from high school to college, I realized something—that was I was not prepared skill-wise to succeed in college. I was taught to walk around the block in my neighborhood and across a little street, but I was never taught to use the address system in a town or navigate by cardinal directions and how to ask questions about directions on how to get somewhere. I had never been able to instruct a driver on how to get from point A to point B. I was reading Braille at 20 words a minute, and I was told in school that that was great. Braille is slow and old fashioned; so, if you can read 20 words a minute that's wonderful. Know that the average reading speed for a sighted person is 100 to 150 words per minute. I had to spend time working on my adjustment to blindness skills training sets. So, I attended a National Federation of the Blind training center called Blind Incorporated, which is the acronym that stands for blindness learning and new dimensions. This is in Minnesota. It is like boot camp for the blind. All of the instructors are blind. So, you can't argue with them about not being able to do something because of your disability. The mentors' service for the students focuses on the skill sets. I pushed myself and became a good cane traveler and a fairly proficient Braille reader at 150 words a minute. Some of my friends are reading Braille at 400 to 500 words a minute. They started when they were born, and I started reading Braille when I was 14.

Once I had my skill set, I went off to college. At Purdue University, I met with a major challenge. I had to take first semester general chemistry, and I was having all kinds of difficulty with it. For reasons that I won't get into here, I graduated from high school not liking chemistry. In addition to not liking chemistry, I didn't know how to do calculations and geometry and subjects of that sort. That's when the Braille became critical because most of my math was obtained through the Braille writing. I used Braille for scientific code and math. Through that I was encouraged by graduate students and faculty to work hard and stick with it, and they assured me that I would get it. I didn't believe them, but I did stick with it. So, I completed the general chemistry course sequence and went on to organic chemistry, and I did that because at the time I was pondering going to medical school where organic chemistry is a requirement. As you may know, that's a very visual curriculum with its organic mechanisms and things of that sort. I developed a two dimensional organic drawing kit that I called an A2D felt board. Using felt and circles to do organic mechanisms made all the difference for me in my classrooms. I got through organic and finished the rest of the curriculum as a chemistry major and went on to graduate school.

As was mentioned earlier, I put on my applications that I was a blind student. The reason why I did that was because I wanted the graduate program faculty and administrators to know what they were getting. I didn't want to get accepted into a program where they thought I was something else, thereby, creating stuff like possible points of conflict. I applied to 12 graduate programs, and I was accepted into four. An excuse of one of the schools that rejected me was that my GRE general verbal score was too low. It was slightly above the national average, but

they said it was too low. I got almost perfect scores on the quantitative analytical structures, but be that as it may. I won't name that school even though I wanted to do it. I went to graduate school where one of the major barriers you have to overcome is to make use of a research advisor. This is, as you know, a critical decision to make. I had to interview with faculty members and explain how I worked with undergraduate students for whom I had to design experiments and conduct laboratory work. So, I said that I will do literature research to propose experiments, run them by you—the advisor, go to the laboratory and carry-out the experiments, and report the results. Now, I had contact with two of the four faculty members that were in the department, but the interesting fact is that they weren't really committed to me joining their groups. After attempting many times to meet with one faculty member, I finally had the opportunity. During that meeting, he just outright said: I don't want you in my group because you're a financial liability. Further, he said: It is obvious that it is going to take you longer to conduct your experiments and collect your data, and I don't have the time to do that. This was a research advisor, and I don't know how the law applies to something like that because you don't want to make them legally do something that they don't want to do. This was a no WIN situation. I thanked him for being honest; you have to look for the bright spot in everything. I went off and looked for the other faculty member with whom I wanted to work. I met with the gentlemen, and now he is my current research advisor. I explained to him how I conduct the literature research and so on and so forth. I asked if he had any questions or concerns, and he said no. I said to him, even the fact that I'm a blind person, that doesn't bother you. He said people with disabilities have to problem solve through everyday life and that's the epitome of what a scientist does. He welcomed me to his research group, and the rest is history.

One of the problems that we wanted to address was the development of tools that not only myself but other people that are blind or have low vision can carry-out independently. That's where we came out with the blind project and the talking tools. I tested many of them. We are disseminating these tools to blind and low vision students across the country and to residential, as well as mainstream schools, in the hopes of providing technology and tools that will give them the mind set that they may want to consider a career in a STEM profession. Whether they do this or not is up to them.

Through my experiences, one of the main things that enabled me to perform better is that I had a mentor. He is a blind chemistry professor. Also, I had supportive faculty at Purdue University and at Penn State. Too many students who are blind may not receive the support that they may need, and they might not be willing to take on a challenge without the technology to enable a hands-on experience. We're hoping that through the research project, the doors of opportunity will be opened.

Some of the barriers on which I was asked to comment refer to the guidance counselor and teachers at high schools. NSF should support teacher training programs to encourage them to realize how technology can be used in the classroom not only for non-disabled students but also for people with disabilities as well and encouraging more universal design approaches whether that be through state standard or curriculum standard. I don't live in either of the two states that are prime candidates for this; so, I can't advocate, but I would like to do that. If you can get a universal design to a book publisher, you're more likely to get that in your curriculum, and that will spread Nationwide. A second thing for which I would like to see NSF do it to pump more money (I don't know if I'm supposed to say this) into the Research in Disabilities Education Program. This will enable projects, such as my own, to develop tools as well as training techniques and teaching modules for teachers to use in learning how to teach students with disabilities and in learning how to inspire them to want to go into STEM professions. This is so critical. Although my project focuses on grades nine through 12, I think we should do more with K through eight. The younger you get the persons with disabilities, the more likely it will be that they are going to consider careers in STEM. I guess with that, that's it, and I thank you very much.

Following the presentations by the three graduate students, Dr. William C. McCarthy moderated the Question and Answer Period.