SCHOOL OF MEDICINE
CASE WESTERN RESERVE UNIVERSITY

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November 19, 12
Re: Nord Grant Applications

Dear UCITE Committee Members:

I seek start-up funding to establish a multimedia outreach program to integrate nanomedicine into education (K-12, undergraduate, graduate). The goal is to introduce novel concepts of how to think about and approach sciences and engineering by interfacing STEM field with the performing arts and gaming disciplines.

To establish this, I am collaborating with award-winning NYC-based Playwright Krista Knight (Vineyard Theatre, letter attached) and Barry Brinegar (Rainbowland Studio, letter attached). We started a multi-disciplinary project entitled **NANOMAN** in the spring of 2012 which bridges the fields of biomedical engineering (Steinmetz), gaming and graphic design (Brinegar), and theater (Knight). Our first endeavor is the ***educational video clip*** NANOMAN, see also http://www.thenanoman.org. The 3-minute video outlines basic principles of drug delivery to treat cancer. The hero, NANOMAN, is on an important mission to deliver highly toxic chemo drugs to cancerous tissue, while avoiding healthy cells. NANOMAN faces various challenges and biological barriers on its journey and fight with cancer. This first video has been a wide success. We have more then 1,500 hits on YouTube. It has been linked to the CSE webpage, and will be linked to NIH/NIBIB's webpage. I was recently interviewed by NIH/NIBIB about my research and emerging outreach program. I have shared the video clip with the STEM director Patty Hunt (Hathaway Brown), who is excited to incorporate the program into STEM classes. At CWRU, I have used this video throughout various lectures and seminars teaching undergraduate and graduate level classes (e.g. EBME105, EBME426, EBME570) with great success. Colleagues in other departments also incorporated the video in their lectures (e.g. EMAC426). Such enthusiastic feedback from institutions, faculty, and students has encouraged us to further develop NANOMAN.

Drug delivery and nanomedicine has become a clinical reality, educating the next-generation of leaders in nanomedicine research and industry is thus an important goal. Based on the success of the NANOMAN, we seek funding to continue and expand our effort to educate students in nanomedicine. Specifically, we will accomplish three tasks:

Task 1: Establish a set of educational videos and incorporate online-taught tutorials. In education, the use of video provides a way of engaging a large and diverse audience. Video clips can be accessed and shared via computers, phones, and tablets. To utilize this interconnectivity and accessibility, we plan to produce three 3-minute video clips that are interlinked with each other. Each video sequence will focus on a different scientific question or engineering principle. The video clips will be accompanied by 5-10 min tutorials by Dr. Steinmetz and/or her students. Dr. Steinmetz mentors 2 post-graduate, 2 graduate, and 10 undergraduate students; the outreach program is directly linked to Dr. Steinmetz research program and graduate and undergraduate students are involved in research and educational training.

Milestones and budget: Publish three video clips accompanied by a tutorial each quarter of the year during the funding period. **1,500 USD** are requested for story development, graphic design, and editing.

Task 2: Implement a NANOMAN video game. The published NANOMAN video clip is a snapshot of what the game may look like. The idea is to teach the students basic concepts of drug delivery through an

interactive gaming experience. In the game, the student can then choose a particular platform (e.g. different shaped nanocarrier equipped with different tools), the chosen platform then has to navigate the biological barriers and fight the cancer. The video game will build on the graphics and stories introduced in the series of videos. Students will be directly involved in the development. Student players will be recruited from the Steinmetz Lab, the BME program and other CWRU campus-wide. We will also include student players from local high schools (e.g. Hathaway Brown). The game will be launched on our thenanoman.org webpage and we will allow players to provide comments to help refine and develop the game. Also, students working in nanomedicine will be recruited as scientific advisors and work with Dr. Steinmetz to keep the game scientifically rigorous.

Milestones and budget: Develop a NANOMAN video game for iOS/android/web/pc/mac platform and launch a full version of the freeware by the end of the tenure of this grant. **700 USD** are requested for development and programming.

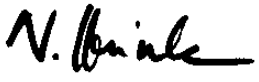
Task 3: Develop a Live Theatrical Work. The objective is to join the STEM discipline with the visual and performing arts. The play will be developed in collaboration with Playwright Knight and Composer/Graphic Artist Brinegar (letter attached). The goal is to create a piece, perhaps framed as a theatrical lecture, that combines cutting-edge research with innovative theatre. We want to create a live experience that is more interactive, engaging, and entertaining than a typical lecture and more informative and educational than at typical play—something that would be at home but still be groundbreaking in a TED Talk or a downtown NY theater space. Dr. Steinmetz and her students will be the actors and The NANOMAN will be a virtual actor on the screen. In a tight, compelling narrative, NANOMAN will communicate with the scientists as they develop new engineering tools for The NANOMAN to fight cancer. Several venues have been identified to perform and disseminate this theatrical/scientific hybrid: HB's annual black box theater and science fair, Northeast Ohio Regional Science Olympiad, and E-Week: National Engineers Week is celebrated annually on CWRU campus. Clips of the play will be filmed and popularized through platforms such as YouTube.

Milestones and budget: Create and develop a 20-min theatrical lecture to be performed by Dr. Steinmetz and her students. We request a total of **3,800 USD** to cover story development, music, production and publicity (2,500 USD) and design and development the NANOMAN costume (300 USD). CWRU lecture rooms and equipment will be utilized for filming. Funds for travel for Knight and Brinegar are budgeted at 1,000 USD to cover travel for rehearsal (Dr. Steinmetz will house the team).

In summary, we are highly committed to this exciting project. The laboratory of Dr. Steinmetz is actively working on reaching a wide audience. For example, at the Biomedical Engineering Society Meeting the Lab Members appeared in jackets promoting the program. A total of ***6000 USD*** *is requested to develop and kick-start a comprehensive outreach program to teach our students and the general public about the exciting developments in nanomedicine.*

We appreciate your consideration of our application. We would be happy to provide additional information if requested.

Best wishes



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Assistant Professor of Biomedical Engineering

Knight & Brinegar

RETRO-FORWARD MUSICAL THEATRE WRITING TEAM

www.KristaKnight.com
www.KnightandBrinegar.com

November 18, 2012

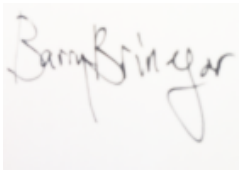
To the UCITE Committee:

This letter serves to confirm our enthusiasm to continue the recently launched outreach program THE NANOMAN with Dr. Steinmetz.

As *Knight & Brinegar*, we are a retro-forward musical writing team. The production of the video clip THE NANOMAN has been an exciting experience and a great test run for us to establish a common language. It is great to hear all the positive feedback from high school teachers and students, but also in the video and performing arts world. We are setting up the webpage thenanoman.org and working on several follow-up videos, video game, and theatrical lecture as outlined in our proposal. The collaboration with Dr. Steinmetz has been instrumental in our work and we look forward to continue this exciting collaboration.

Sincerely,

Krista Knight



Barry Brinegar