# Ethan Nyberg, Ph.D.

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Department of Biomedical Engineering
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## Summary

- **Tissue and regenerative medicine engineer** with 8 years in development and practice of vascular and orthopedic methods; focuses on cell biology, stem cell isolation and clinical use, preclinical studies, device design, regulatory process.
- **Experienced in** regenerative biomaterials, animal models; recently managed a study of implants combined with autologous stem cells to regenerate craniofacial bone in swine.
- **History of science communication** with numerous publications (9 first author), presentations (20 at national and international meetings), contributing to and reviewing manuscripts, grants, book chapters, and patents.
- **Accomplished at collaborating with and managing cross-disciplinary expert teams**; across academic, research, clinical, and industry environments.
- **Managerial experience**: managed staff of 6 research assistants at Johns Hopkins, supervised 20 teaching assistants, and mentored 7 research students/staff.
- **Teaching experience** in engineering, design, bioethics, and business; in traditional lectures, online and flipped classroom environments, course creation, and experiential education.
- **Graduate and undergraduate education** and training in a wide range of engineering concepts, principles, and methodologies including: cell biology, physiology, immunology, anatomy, genetic engineering, biomaterials, regulatory affairs, device design, and tissue engineering.
- US Citizen; based in the Mid-Atlantic Region.

## Education

**Ph.D., Biomedical Engineering,** Johns Hopkins University**,** Baltimore, MD **July 2019**
**Thesis:** 3D-Printed Tissue Engineered Bone Scaffolds for Craniofacial Skeletal Regeneration

**B.S., Biomedical Engineering, Engineering Business Minor** **May 2014**
**University of Virginia,** Charlottesville, VA ABET Accredited GPA: 3.6
**Theses:** (1) Adipose-derived Stem Cells in Vascular Constructs: Pericyte-like Function
(2) Societal, Ethical, and Technological Contributions to Organ Transplant Policy

## Certifications and Training

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| **Regulatory Affairs Professional Society**, Training Fellow, Certificate | 2016 |
| *6 months of training in US and global regulatory affairs and practice* | |
| CDER World, Online course | 2017 |
| **EIT Designation,** registered in Virginia | 2014 |
| Rodent Biomethodology | 2013 |
| Human Subjects Research | 2014 |
| Teaching Certificate, Flipped Classrooms & Experiential Learning | 2016 |
| Training and Practice of Clinical Staff | 2016 |
| Research Ethics I, II | 2014, 2016 |
| Title IX Workplace and Harassment Prevention for Supervisors | 2015, 2017 |

**Research Associate, Johns Hopkins School of Medicine** **08/2014 - 07/2019**

Supervisor: Dr. Warren Grayson wgrayson@jhmi.edu **(GS-12 Equivalent)** 50 hrs/week

**Conducted and managed over 25 engineering and biologic scientific studies**/projects, often developing new protocols/techniques and devices, as well as using established and novel experimental protocols:

- 8 years as a researcher designing and studying implanted medical devices; conducting complex studies and experiments to investigate biological, chemical, and physical processes that affect biologic resources (particularly dermis, adipose, bone, & vascular).
- **Developed multistep processes** (material and device manufacturing, stem cell isolation) and **combination products** (combinations of implants, drugs, stem cells) as medical devices to replace craniofacial orthopedic deficits. Prepared technical and complex reports about the accuracy and effectiveness of the device across the range of product development to submit to the DOD and other funding partners.
- Pre-clinical animal studies in mice, rats, and swine to assess implant effect on bone formation, vascular networks, and immune system.

**Experienced preparing/analyzing, presenting, and defending the data**, results, and findings of these scientific/research studies to industry partners, supervisors, and the general field in presentations, posters, book chapters, and journal publications (7 years).

- **Author** of 11 peer-reviewed journal articles, 20 conference presentations, & 1 patent.
- **Co-authored grants** submitted to Department of Defense, California Institute for Regenerative Medicine, National Science Foundation, Maryland Stem Cell Research Foundation, and the National Institutes of Health; contributing to the design of proposed experimentation processes.
- **Managed the reporting requirements** (wrote quarterly and annual reports, HRPO and ACURO applications and protocols) for Department of Defense Vision Research Program grant ($1.5M) over three years.

**Reviewed and interpreted scientific/medical data** to provide recommendations and advice.

- **Prepared synopsis and analysis of literature** (12 internal briefings and two published review articles), interpreting experiments and results, and incorporating recent developments, trends, and technological across immunology, engineering, device design, validation and verification methods, orthopedics, medical devices, and regenerative medicine. This review work included analyzing conventional issues.
- **Peer reviewer** for six journals: *Stem Cells, Stem Cells Translational Medicine, Annals of Biomedical Engineering, ACS Applied Materials and Interfaces, Journal of Biomaterials Science, Medical & Biological Engineering & Computing*.
    - **Provided scientific expertise review** of biologic experimentation processes in research articles submitted to the journals.
    - Involving biologic processes, clinical data, and technical device descriptions.
    - Critical review of test methods, claims, and data; suggesting additional methods and experiments before accepting for publication.
- Reviewed and **recommended changes and improvements** to grant applications evaluating technical scientific data, device descriptions, and test methods (submitted to NIH, DOD, NSF, and MSCRF); often suggesting different test methods to assess device safety and efficacy; via written reports.
- Analyzed the synopsis of medical devices studies during grant review, peer review; and recommended improvements based on interpretation of scientific & regulatory directives.
- Trained graduate students and research staff to perform the above tasks across a wide range of engineering techniques and medical device products.

**Collaborated and consulted on cross-disciplinary research projects.**

- Healthcare professionals/clinicians: Plastic Surgery, Neurosurgery, Veterinary Medicine, Orthopedics, Fetal Therapy, Ophthalmology, Radiology.
- Industry partners: Geistlich, Cosmetic Surg LLC, Solid Works, Depuy Synthes.
- Consulted expert for technical advice on complex scientific tests to assess a range of medical and biological conditions (spinal fusion, cranial vault reconstruction, spina bifida).
- As a part of these collaborations and consultations, I routinely prepared and presented briefings and recommendations about medical devices or test methods to supervisors and collaborators, and I predicted and managed a wide range of project technical needs.

**Supervised** 7 undergraduates, 2 masters students, 2 post-bachelors, and a high-school student. Trained them in research skills including: study design, technical tissue engineering skills, animal handling, experimental protocols, and results presentation and dissemination.

- During 5 years at Johns Hopkins, I provided technical advice and training for my staff as they conducted complex scientific tests for mechanics, sterility, mineral and bone deposition, biocompatibility, and stem cell function; all within 3D-printed medical devices.
- This training included reporting results, critical analysis of medical device data, and designing studies and experiments to assess biologic impact of 3D-printed devices.
- I also supervised and trained them in identifying and reporting safety and hazardous situations in the laboratory environment (chemical, biology, and manufacturing risks) and in animal and clinical environments (implanted medical devices, human data, animal care and use).

**Medical Device Development and Testing / Medical 3D-Printing Experience (4 years)**

Managed 3D-printing core at Johns Hopkins Translational Tissue Engineering Center

- **Developed and modified test methods and protocols** to collect and report medical data for 3D-printed devices, specifically for mechanics, manufacturing validation, and bioactivity, in compliance or addition to industry standards and regulatory guidelines (ISO and ASTM), for medical device submission.
- **Assessed the accuracy, precision, and reliability** of 3D-printed medical devices, managed the calibration and repairs to manufacturing machines to ensure quality.
- Evaluated, modified, and developed **guidelines for collecting and assessing novel data** required in 3D-printed device design and testing/scientific systems: patient-specific shape verification, mechanical validation, and manufacturing artifacts.
- Managed all aspects of **virtual treatment planning and medical 3D-printing** (digital technology and additive manufacturing) for three large animal studies and two retrospective human clinical studies. Operated additive manufacturing systems for these studies (fabricated medical models and custom implants).
  - Included digital preparation and management of 3D files for printing from medical scans.
  - Digital designs of guides and implants for humans and animals, of silicone molds.
- Acquired and segmented **medical images** from CT, MRI, ultrasound, and cone beam CT for device and surgical guide design (including 3D digital models) in Mimics, MATLAB, and ImageJ. Developed standard protocols and trained staff on digital technology to process images (including 3D reconstruction) and design products.
- **Manufactured and post-processed** (included auxiliary equipment) medical models, custom implants, and interventional devices for surgical practice including: spina bifida, spinal fusion, spinal laminectomy, and craniofacial reconstruction.

- **Planned the expansion of 3D-printing core**, managed installation of new printers, routine maintenance, calibration, and repairs of 3D-printing systems. These responsibilities included the design and building of test and calibration elements and accuracy files to establish a quality system for medical manufacturing.
- **Developed new software** to design porous craniofacial implants, wrote corollary software to control the 3D-printing of such implants (GCODE, with portions in MIMICs and MATLAB).
- **Established methods** for the validation and verification of patient-specific 3D-printed implants by direct computational comparisons of post-processed 3D-printed parts with design file (enabled by the new software developed above).

**Stem Cell Isolation and Use**

- Wrote, established, and operated institutional review board (IRB) protocols at multiple clinical centers to collect patient adipose tissue for stem cell analysis (three years).
- Designed and implemented SOPs for the more rapid isolation of stem cells from patient tissue samples.
- Demonstrated differences in the functional potential of freshly isolated stem cells and donor-matched cells that were culture-expanded.
- Advised other researchers on regulatory policy developments on stem cell isolation devices, techniques, and stem cell use.

**Preclinical Animal Studies**

- Wrote eight IACUC/ACURO protocols for mouse, rat, and swine models of bone graft assessment, blood vessel integration, and stem cell activity.
- **Conducted over 15 studies of implant biology** and bone regeneration in rodents, performing all aspects from study design, surgery, animal care, imaging, harvesting, histology, and reporting.
- Developed porcine models of human craniofacial bone injury and stem cell isolation/treatment.
- **Trained graduate and undergraduate researchers** on animal handling and surgical techniques.
- **Managed a multi-year study to test tissue engineered 3D-printed bone constructs and stem cell treatment in pigs.**
    - Led collaboration of a multiple-institution team of Johns Hopkins Biomedical Engineering, University of Maryland Craniofacial Surgeons, and Louisiana State University Veterinarians.
    - Project management included setting meeting agendas, coordinating expectations, managing project technical needs, and ensuring deadline achievement.
    - Coordinated the design, manufacture, quality checks, sterilization, and implantation of 3D-printed bone replacements with pig-matched adipose-derived stem cells in 18 Yucatan swine.
    - Planned surgical protocol, including virtual surgical planning and the design and manufacture of surgical guides and fixation hardware.
    - Developed standard operating procedures (SOPs) to isolate adipose-derived stem cells during the surgical procedure (<1 hour) and implant the cells with the 3D-printed bone.
    - Successfully regenerated bone within the 3D-printed implant at 6-weeks (40% volume regenerated) and 3 months (60% volume regenerated).

**Regulatory Consulting** **06/2017 - 07/2019**

Volunteer, Johns Hopkins University 8 hours/week

**Provided regulatory recommendations** to my research group & others on a range of issues:

- My training in regulatory affairs enabled me to interpret FDA guidance and directives for questions about product classification, regulatory pathways, tests for biocompatibility, and mode-of-action determination. This advice on compliance and regulatory policy developments ensured accurate regulatory orientation in early research stages.
- Consulted and advised on wide-ranging types of devices, including spinal fusion cages, bone implants, cell isolation devices, insulin monitors, bioreactors, compartment syndrome diagnostic devices, and aortic stents.

***Research Assistant*, University of Virginia** **02/2011 - 06/2014**

Supervisor: Dr. Shayn Peirce-Cottler smp6p@virginia.edu 30 hrs/week

- Received training in stem cells isolation, biochemical characterization, cell culture, pre-clinical animal studies, microscopy.
- Conducted research studies to assess pericyte-like function of adipose-derived stem cells in regenerative roles in the liver, eye, skin, and bone.
- Managed studies to assess mesenchymal stem cell function across all body systems following bone marrow transplant, with additional focus on roles in bone healing.
- Used genetically modified mouse strains to isolate, differentiation, and track stem cells in transplantation therapies.
- Collected and presented data from histology, uCT, blood panels, flow cytometry, and cell staining.
- Developed 3D-bioprinting system, inks, and cell preparations to manufacture liver, pancreas, and kidney scaffolds using stem cells and primary human cells.

***Lecturer*, Johns Hopkins University** **01/2015 - 12/2018**

Supervisor: Dr. Eileen Haase ehaase@jhu.edu 10-25 hrs/week

- Certificate from Teaching Academy, Johns Hopkins Center for Integration of Teaching and Learning. Completed a three-day course to develop teaching skills including: active learning, flipped classrooms, course design, and student assessment.
- Designed and taught courses to undergraduate students including lectures, case studies, simulations, small group sessions, and online engagement and management. Also taught writing workshops and held office hours.

***(1) The Ethics and Business of Regenerative Medicine***

- About business, policy, ethics, and societal dimensions of recent advances and failures of regenerative medicine, including stem cells, immunotherapy, and biobanking.
- Each offering had ~30 students.

***(2) Engineering Design Process for Craniofacial Implants***

- Taught the engineering design process using craniofacial implants, including regenerative and stem cell principles, the constraints of the regulatory process, and product development.
- ~10 students each time the course was offered.

**(3) *Biomedical Engineering Modeling and Design***

- Taught 12 sections of undergraduate students (95 students total) and managed a team of 20 teaching assistants.
- Taught principles of modeling human systems and design process of medical treatments.
- Provided feedback on writing technical reports, creating and giving presentations, and career advice.

***(4) Societal Dimensions of Nanotechnology***

- Taught students the technology development process using seminars from researcher and industry experts and an online simulation environment.
- Online and in person blended course, with 20 students and 1 teaching assistant each offering.

Teaching reviews available upon request.

## Awards and Honors

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|---|---|
| Travel Award, Symposium on Advanced Biomanufacturing, University of Virginia | 2018 |
| Finalist, Research Symposium, Johns Hopkins Dept. of Medicine | 2018 |
| Winner, Student and Young Investigator Section, TERMIS-Americas | 2017 |
| Travel Award, Graduate Student Association, Johns Hopkins | 2016 |
| Medical Hackathon, 2nd Place Winner, Johns Hopkins | 2015 |
| Outstanding Student Award, School of Engineering and Applied Science, UVA | 2014 |
| Eagle Scout / Order of the Arrow, Boy Scouts of America | 2007 |

## Extracurricular Activities

**Biomedical Engineering PhD Program Student Council** 2014-2017

- Managed recruitment and social activities with a budget of $10,000.
- Chairperson for annual program retreat with a budget of $24,000

**Research Experience for Intercity Students,** Summer Employer 2015
Mentored and employed students from local inner-city high-schools as lab technicians.

**Peer-Mentoring Program, Univ. Virginia.** Co-founder, Mentor. 2012-2014
Helped to conceive and design a peer-mentoring program to address the needs of students struggling academically, socially, mentally, or emotionally as they pursue an engineering degree. Organized and facilitated events and mentor training.

**Hobbies:** Woodworking, open-water swimming, running, beach volleyball, karate, backpacking

## Research Skills

**Preclinical Animal Skills:**
8-years of experience with preclinical animals, assessing study design and results.

- Animal care (swine, rat, & mouse), handling, surgery prep, post-surgery care, & barrier training. Certified in rodent biomethodology.
- Blood & bone marrow harvest for flow cytometry prep & cell culture.
- Cranial defect models, subcutaneous implant models, intramuscular implant models, and dorsal skinfold window chamber models.
- Bone tissue histology, whole-mount immunohistochemistry, MicroCT scanning & analysis, MicroFil vasculature perfusion, Laser Perfusion Doppler Imaging.
- Medical imaging processing: CT, MRI, Cone Beam CT, and ultrasound.
- Tissue (fat, vasculature, skin) explants, characterization, and modeling.
- Biocompatibility and toxicology assessments of biomaterials, implanted devices.

**Biochemistry:**

- Biochemical assessment of mineral deposition (calcium assays, enzyme assays, matrix staining).
- Protein isolation and detection by western blots, immunofluorescence, ELISA assays, RNA isolation, reverse transcription, and detection by RT-PCR.

**Cell Biology:**

- Adherent cell culture (2D, 3D, and bioreactors) of primary mammalian cells, stem cells.
- Cytokine, growth factor, and drug treatment of stem cells, dosing, and evaluation.
- Cell and stem cell isolation from mouse, rat, swine, and human, often developing novel protocols and isolation assessments.
- Assessment through imaging (bright field & fluorescence), flow cytometry, confocal microscopy, antibody and live-cell labeling.

**Computer Skills:**

- Statistical analysis: Minitab, Prism, R.
- Medical image processing and programming: ImageJ, MIMICs, MATLAB.
- Proficient in: Solid Works, Microsoft Word, Excel, PowerPoint, Adobe Acrobat.

**Orthopedic Implant Design, Manufacturing & Materials Science Characterization:**
6-years of experience engineering, manufacturing, and testing 3D-printed medical devices.

- Medical image acquisition, filtering, reconstruction, and segmentation (all in 3D).
- File management of medical images, design files across multiple platforms, including DICOMs from a range of CT machines, MRI, and ultrasound scans.
- CAD design (construction of digital design) of orthopedic implants, surgical guides, and anatomic models with and without medical image guidance/basis.
- 3D-manufacturing of polymer implants using FDM, SLS, and DLS.
- Post-processing of 3D-printed implants including surface treatments, sterilization, and packaging.
- Material assessments: mechanical testing, scanning electron microscopy, atomic force microscopy, scanning tunneling microscopy, degradation, swelling, impurity leeching, Raman spectroscopy, DSC analysis.
- Authored SOPs for the design and manufacturing process, incorporating design validation and verification, design history files, good manufacturing practice, and quality control, quality control systems.

## Publications

1. **Nyberg, E.L.**, Farris, A.L., O'Sullivan, A., Rodriguez, R.L., Grayson, W.L. Differences between SVF and P2 ASCs in forming bone *in vitro* and *vitro*. *Tissue Engineering Part A* (2019)

2. **Nyberg, E.L**., Osanov, M., Chartrain, N., Farris, A.L., Aggarwal, S., Williams, C., Guest, J., Grayson, W.L. Topology Optimized Design of Unit Cells for Graded Bone Tissue Engineering Scaffolds. (**In Preparation,** 2019)

3. **Nyberg, E.L**., Guest, J., Grayson, W.L. Optimized Pore Structure and Mechanics in 3D-Printed Bone Replacements According to Physiologic Load (**In Preparation,** 2019)

4. **Nyberg, E.L**., Bart, Dorafshar, A.H., Grayson, W.L. Feasibility of 3D-printed Scaffolds in Different Craniofacial Defects: a Retrospective Patient Study (**In Preparation**, 2019)

5. **Nyberg, E.L.**, & O'Sullivan, A., Grayson, W.L. scafSLICR: a MATLAB-based Slicing Algorithm to Enable 3D-Printing of Tissue Engineering Scaffolds with Heterogenous Porous Microarchitecture (**Accepted**, 2019)

6. **Nyberg, E.L**. and Grayson W.L. Assessing the Minimum Time-Period of Normoxic Preincubation for Stable Adipose Stromal Cell-Derived Vascular Networks. *Cell. and Mol. Bioengineering.* (2018)

7. **Nyberg, E.L**., Rindone A., Dorafshar, A.H., and Grayson, W.L. Comparison of 3D-Printed Poly-ε-caprolactone Scaffolds Functionalized with Tricalcium Phosphate, Hydroxyapatite, Bio-Oss, or Decellularized Bone Matrix. *Tissue Engineering Part A.* (2016).
   **** Most Read *Tissue Engineering* Article of 2017 ****

8. **Nyberg, E. L**., Rindone, A., & Grayson, W. L. 3D-Printing Composite Polycaprolactone-Decellularized Bone Matrix Scaffolds for Bone Tissue Engineering Applications. *Methods in Molecular Biology.* (2017).

9. **Nyberg, E.L**., Farris, A.L., Hung, B.P., Dias, M., Garcia, J.R., Dorafshar, A.H., and Grayson, W.L. 3D-Printing Technologies for Craniofacial Rehabilitation, Reconstruction, and Regeneration. *Annals of Biomedical Engineering*. (2016).

10. Hung, B.P., Naved, B.A., **Nyberg, E.L**., Dias, M., Holmes, C.A., Elisseeff, J.H., Dorafshar, A.H., and Grayson, W.L. Three-dimensional printing of bone extracellular matrix for craniofacial regeneration. *ACS Biomaterials Science & Engineering*. (2016).

11. **Nyberg, E.L**., Holmes, C., Witham, T., & Grayson, W. L. Growth Factor-eluting Technologies for Bone Tissue Engineering. *Drug Delivery and Translational Research*. (2015).

## Presentations

1. Ashley L. Farris, Dennis Lambrechts, Nicholas Zhang, Alexandra Rindone, **Ethan L. Nyberg,** Aine O'Sullivan, S. J. Burris, Kendall Free, and Warren L. Grayson. *Tunable Oxygen-Releasing, 3D-printed Scaffolds Improve In Vivo Osteogenesis*. (Oral Presentation, 2019) Society for Biomaterials Conference

2. **E. Nyberg,** A. Farris, A. O'Sullivan, M. Grant, and W. Grayson. *3D-Printed Craniofacial Bone Grafts with Autologous Cells for Bone Regeneration.* Military Health System Research Symposium, Florida 2019.

3. **E. Nyberg,** A. Farris, A. O'Sullivan, and W. Grayson. *Assessing the Osteogenic Potential of Adipose-derived Stromal Vascular Fraction Cells.* Johns Hopkins DOM Retreat
   **** Student Research Finalist ****

4. **E. Nyberg,** A. Farris, A. O'Sullivan, and W. Grayson. *scafSLICR: A MATLAB Tool for Designing 3D-printed Tissue Engineered Scaffolds with Heterogeneous Features*. Poster at the Symposium on Advanced Biomanufacturing. Charlottesville, Virginia. November 5, 2018

5. **Nyberg, E. L.,** O'Sullivan, A., and Grayson, W. "Design and manufacture of 3D-printed scaffolds for regeneration of massive craniomaxillofacial bone loss". *World Congress of Biomechanics.* Dublin, Ireland. July 2018.

6. O'Sullivan, A., **Nyberg, E.,** Grayson, W. *3D Printing Heterogeneous Porous Patterns in Tissue Engineered Bone Scaffolds.* Presentation at Northeast Bioengineering Conference. Philadelphia, Pennsylvania. March 2018. (Oral Presentation)

7. Aggarwal, S., **Nyberg, E.,** Osanov, M., Guest, J., & Grayson, W. *Design of 3D-Printed Craniofacial Bone Scaffolds for Physiologic Loading.* Poster Presented at Institute for Nano Biotechnology Innovation through Engineering Symposium. Baltimore, Maryland. May 2018.

8. **E. L. Nyberg**, A. Farris, W. Grayson. *Assessing the Osteogenic Potential of Adipose-derived Stromal Vascular Fraction Cells.* Poster at the Tissue Engineering and Regenerative Medicine Society Annual Conference. Charlotte, North Carolina. (2017)
   **** Winner, Student and Young Investigator Section ****

9. O'Sullivan, A., **Nyberg, E.,** Grayson, W. *Design, Manufacturing, and Analysis of 3D Anatomic Bone Scaffolds* **2nd Place** Poster Presented at Institute for Nano Biotechnology Innovation through Engineering Symposium. Baltimore, Maryland. November 2017.

10. Aggarwal, S., **Nyberg, E.,** Osanov, M., Chartrain, N., Farris, A., Guest, J., & Grayson, W. *Validating Bio-Scaffolds Optimized for Mechanical Strength and Permeability.* Poster Presented at Institute for Nano Biotechnology Innovation through Engineering Symposium. Baltimore, Maryland. November 2017.

11. O'Sullivan, A., **Nyberg, E.,** Grayson, W. *Design, Manufacturing, and Analysis of 3D Anatomic Bone Scaffolds* Presentation at Johns Hopkins University Undergraduate Research Symposium. Baltimore, Maryland. October 2017. (Oral Presentation).

12. Aggarwal, S., **Nyberg, E.,** Osanov, M., Chartrain, N., Farris, A., Guest, J., & Grayson, W. *Validating Bio-Scaffolds Optimized for Mechanical Strength and Permeability* Presentation at Johns Hopkins University Undergraduate Research Symposium. Baltimore, Maryland. October 2017. (Oral Presentation).

13. **E. L. Nyberg,** A. Rindone, A. O'Sullivan, W. Grayson. *Manufacturing of 3D-Printed Polycaprolactone Scaffolds Functionalized with Tricalcium Phosphate, Hydroxyapatite, Bio-*

*Oss, or Decellularized Bone Matrix*. Poster at the Symposium on Advanced Biomanufacturing. Charlottesville, Virginia. November 6, 2017

14. **Nyberg E.L.**, Hutton D.L., Grayson W.L. ASC Vascular Assembly in Hypoxia is Mediated by the Extent of Normoxic Preassembly. *Tissue Engineering Part A, Vol 21 p176* (2015)

15. D.T. Bowers, L. A. Langman, **E. L. Nyberg**, B. J. Kane, D. A. Griggs, D. R. Dart, J. K. Bagwell, D. D. Johnson, B. L. Allen, P. Chhabra, A. Toumadje, C. A. Campbell, S. M. Peirce, K. L. Brayman *Bioartificial Pancreas Engineering Using 3D Bioprinting* Presentation to the Department of Surgery, University of Virginia. Charlottesville, Virginia. April 15, 2014.

16. **E.L. Nyberg** *Biofabrication of Microvascular Components of Organs.* American Society for Artificial Internal Organs Design Competition, Washington D.C. June 6, 2014.

17. S. M. Cronk, T.A. Mendel, **E. L. Nyberg**, A. R. Sheets, A. C. Bruce, I. M. Herman, P. A. Yates, and S. M. Peirce *Adipose-derived Stem Cells from Healthy and Diabetic Mice have Differential Effects on the Retinal Microvasculature* Presentation to the Tissue Engineering and Regenerative Medicine Society Annual Conference. Atlanta, Georgia. November 12, 2013

18. **E. L. Nyberg**, S. Seaman, and S. M. Peirce *Evaluating Pericyte-like Behaviors of Adipose-derived Stem Cells on Excised Microvessels* Presentation to the Biomedical Engineering Society Annual Meeting. Seattle, Washington, September 27, 2013

19. S. M. Cronk, T.A. Mendel, **E. L. Nyberg**, A. R. Sheets, A. C. Bruce, I. M. Herman, P. A. Yates, and S. M. Peirce *Hyperglycemia Suppresses Revascularization potential of Adipose-derived Stem Cells in the Treatment of Diabetic Retinopathy* Presentation to NHLBI Symposium on Cardiovascular Regenerative Medicine. Bethesda, Maryland. September 26, 2013

20. C. S. Huang, **E. L. Nyberg**, R. C. Ogle, and E. A. Botchwey *Local Sustained Delivery of FTY720 Accelerates Bone Growth and Enhances Bone Graft Integration* Presentation to the Biomedical Engineering Society Annual Meeting. Atlanta, Georgia, October 27, 2012.

## References

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