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Adrienne R. Minerick, PhD
Bioengineer

 <p>BIOENGINEER ADRIENNE R. MINERICK, PhD</p> <p>Place of Employment: Michigan Technological University</p> <p>Type of Research: Biomedical Microdevices <i>For example, tiny devices to measure and manipulate living cells</i></p> <p>"If a person is determined to learn, there will always be opportunities or resources for that person to pursue an education in science and engineering... There is a <i>real</i> demand for scientists and engineers whose contributions advance knowledge, technology, and the economic foundation of our society. I chose my career because I wanted to be a part of advancing knowledge and facilitating others to gain knowledge."</p>	<p>CAREERS IN SPOTLIGHT: BIOENGINEER</p> <p>What do they do? A bioengineer uses the principles and tools of engineering to address problems in biology and medicine, creating usable products. These include designing medical devices, diagnostic equipment, renewable bioenergy, and genetically modified organisms.</p> <p>What kind of training is involved? A bachelor's degree in engineering is required for almost all entry-level engineering jobs. Sometimes a graduate degree is also required, such as a Master's degree or PhD</p> <p>What is a typical salary for a Research Scientist? The average salary is about \$55,000/year (\$26/hour), with a range from \$45,000/year (\$22/hour) to more than \$120,000/year (\$58/hour).</p>
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1. Where did you grow up?

Alamosa, CO – it is a small college town in the center of a high altitude mountain valley.

2. What do you do (i.e., what career or field are you in; what is the title of your position)?

I'm an associate professor of chemical engineering at Michigan Technological University in Houghton, MI. My job is a combination of research with graduate and undergraduate students, and teaching bio-focused chemical engineering courses. My research is on biomedical microdevices. We use electric fields to distinguish ABO blood types that will help change medical diagnostics.

3. How did you choose your career? When did you first know this was the career you wanted?

Education is a very valuable asset that transcends all socio-economic classes. If a person is determined to learn, there will always be opportunities or resources for that person to pursue an education in science and engineering. On the other side of the college experience, there is a real demand for scientists and engineers whose contributions advance knowledge, technology, and the economic foundation of our society. I chose my career because I wanted to be a part of advancing knowledge and facilitating others to gain knowledge.

4. Did your family support your decision to pursue your career?

Yes, mostly. Some did not understand what an advanced degree (MS/PhD) really was. They didn't understand that it wasn't just coursework. Now that I'm a professor, they think that all I do is teach and don't really understand what goes into writing research proposals, managing a lab of researchers/equipment, and publishing papers to disseminate knowledge to others.

5. What is the highest level of education you have?

PhD in Chemical Engineering.

6. What is the highest level of education reached by other members of your family?

Mother – PhD in Vertebrate Paleontology.

Father – PhD in Mathematics.

7. What is the salary range for a person in your position?

\$85,000 - \$95,000 over nine months (professors aren't paid for three months in the summer unless they secure research funding to pay those three months). [That's about \$41-\$46/hour.]

8. What do you like most about your job?

The freedom and the variation. When an exciting research problem presents itself, I have the ability to seek resources to pursue and explore that. No day is the same and I'm continuously learning and challenging myself.

9. What do you like least about your job?

Sometimes students are just after a grade and not truly interested in learning. I don't like having to discuss allocations of points with students like that.

10. What's an abbreviated day in the life of your job?

This varies so much. I'll describe my favorite day. I come in, catch up on email and note the important tasks I need to do for others that day. I meet with one of my graduate students, see the data they collected over the last week. We discuss what it means and make plans for experiments for the next week. I study material and prepare lecture notes. Search for nice visuals online or in books/other resources. Go to class and lecture/work problems with students. Meet with undergraduate senior unit operations team who is doing a lab experiment under my supervision (we use pilot scale equipment in our curriculum). Read/review research article and provide feedback to editors on whether it should be published. File away this information for later (knowledge of the literature is important to continue learning and advance knowledge). This type of information will later be used to develop creative ideas to solve real research problems.

11. In one to two sentences, how would you say you use bioinformatics in your work? If you don't use bioinformatics directly in your work, how has bioinformatics impacted your career field?

Biomedical engineering is a broad field. Basically any area of engineering that uses its knowledge to solve biological problems qualifies. Bioinformatics in the traditional sense is using mathematical tools to compile and understand large amounts of biological data (DNA sequences, protein folding, etc.). I don't do this traditional work. Instead, I explore how chemical expression in biological cells impacts behaviors within microchannels the width of a human hair.

12. Do you have any recommendations for students who are interested in entering your field?

Yes! There is no traditional educational path to this type of research. Follow your interests and look for the links between the different areas. This approach will give you a unique background and thus unique insights to be able to solve problems.

13. What are your favorite hobbies?

Gardening, my two kids, my husband, cooking, our two dogs, camping, equestrian riding, remodeling our house, woodworking, boating. I also want to get my pilot's license and learn to quilt.

Resources:

In the **field of bioengineering**, there are many different types of jobs available, depending upon what type of education and experience you have. For more information about different types of jobs in this field, including what you can do with different degrees (two year Associate's degree, four year Bachelor's degree, graduate, or professional degrees), visit NWABR's Student Career Center at: <http://www.nwabror.org/students/student-resource-center/career-center>.

The site also includes descriptions of and links to different types of degree programs, various career paths, resources on writing a resume and cover letter and evaluating online resources, and tips for successful job interviews.

All of the links below can also be accessed from NWABR's Student Career Center.

To learn about **job prospects**, **salary information**, and **job skills** ("qualifications") required for engineering in general, and biomedical engineers in particular, visit the US Bureau of Labor Statistics: <http://www.bls.gov/oco/ocos027.htm>.

Find information on careers in biomedical engineering at the National Human Genome Research Institute, including information about **career outlook**, working conditions, and **salary**. Scroll through the career listings until you reach "Biomedical Engineer" one page 1: <http://www.genome.gov/GenomicCareers/careers.cfm>.

To learn more about careers in bioengineering, visit the Biomedical Engineering Society's Frequently Asked Questions page at: http://www.bmes.org/aws/BMES/pt/sp/be_faqs.

You can also visit the Sloan Career Cornerstone Center's webpage on Bioengineering at: <http://www.careercornerstone.org/bioeng/bioeng.htm>.

Dr. Minerick is the Director of the Medical Micro-Device Engineering Research Lab (MD-ERL) at Michigan Tech: http://www.mderl.org/all_projects.php.

Some of the Resources above may also be used to research other careers that may be of interest to you in the future, including the Bureau of Labor and Statistics and the National Human Genome Research Institute.

Job Posting: Biomedical Engineering Summer Internship

The laboratory of Dr. Maynard Smith is looking for motivated individuals interested in learning about the development of small biological microdevices that can be used to detect disease-causing mutations in small samples of patients' blood. Interns will work closely with lab members and help develop and evaluate microdevices. Prior lab experience is not necessary, but an understanding of molecular biology, including the role of DNA in encoding human traits, is required. Applicants familiar with genetic testing and bioinformatics tools used to detect mutations are encouraged to apply. Additional computer skills, including Microsoft Office (Word®, Excel®, PowerPoint®), are preferred. Applicants must be hard-working, responsible, and able to work in a team environment. Address all inquiries to Dr. Maynard Smith, Seattle Research University, Biomedical Devices Department, Suite 100, Seattle, WA

LESSON 7

CLASS SET

7 Deborah Tegarden, DVM Veterinarian

 <p>VETERINARIAN DEBORAH TEGARDEN, DVM</p> <p>Place of Employment: Elliot Bay Animal Hospital Seattle, Washington</p> <p>"While we often think of genetic testing in humans, vets are seeing more and more tests being developed for animal patients. This is the most exciting time I can imagine in veterinary medicine, when things are getting more and more cutting edge and technology is developing at lightning speed."</p>	<p>CAREERS IN SPOTLIGHT: VETERINARIAN</p> <p>What do they do? Veterinarians diagnose and treat animals. Some veterinarians specialize in a particular area (such as oncologists who treat cancer), and some perform research to improve animal and human health. Veterinary technicians assist veterinarians in their work.</p> <p>What kind of training is involved? Veterinarians complete a Bachelor's degree and a DVM (Doctor of Veterinary Medicine) degree, which requires four years. Veterinary technician training is usually a two year (Associate's) program.</p> <p>What is a typical salary for a Research Scientist? Veterinarians: \$45,000/year (\$22/hour), up to \$140,000/year (\$67/hour). Veterinary Technicians: \$20,000/year (\$10/hour), up to \$45,000/year (\$22/hour).</p>
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1. Where did you grow up?

Near Portland, Oregon.

2. What do you do (i.e., what career or field are you in, what is the title of your position)?

I am a veterinarian in Seattle, Washington.

3. How did you choose your career? When did you first know this was the career you wanted?

I think I always wanted to be a veterinarian. I remember talking about it as early as my third grade essay contest, in which I described my love of animals.

4. Did your family support your decision to pursue your career?

Very much so! It was always expected that I would go to college and my parents always supported my dreams.

5. What is the highest level of education you have?

I obtained a Bachelor's degree from Portland State before joining the joint degree program in Veterinary Medicine offered through Oregon State and Washington State Universities. I now have a DVM (a Doctor of Veterinary Medicine).

6. What is the highest level of education reached by other members of your family?

I had eight half brothers and sisters, and I was the first of them to go to college. My dad went to college, however, and really valued education. I'm the youngest of my siblings.

7. What is the salary range for a person in your position?

It ranges depending upon where you are and what kind of animals you see. Most veterinarians start around \$40,000 per year [\$19/hour]; the average is about \$60,000-\$100,000 per year [\$29-\$48/hour].

8. What do you like most about your job?

I love that nearly every day, I learn something new at work. I feel like the variety of the job keeps it exciting and constantly evolving.

9. What do you like least about your job?

This job, at least at a very busy, fast-paced clinic like mine, can be extremely emotionally and physically draining. It has taught me to really value my time outside of work and create boundaries between the two so that I can fill back up!

10. What's an abbreviated day in the life of your job?

Since I've had a baby, I work three days a week instead of four. We all alternate between roles in the clinic.

If I'm seeing appointments, I arrive at 8:00 am. I see about 15-16 appointments in the morning – one every 20-30 minutes. It's fast-paced. I have to think on my feet and make quick decisions and recommendations. I really enjoy the social interaction with clients during appointments. Some days I take a lunch break of an hour, some days the appointments spill into lunch. Then I make phone calls answering client questions for about an hour. In the afternoon, I see about four to six appointments. Then I make phone calls and go home around 7-7:30 pm.

Emergency days are challenging. I come in at 7:00 am. I examine and make plans for any pets in the hospital. Then I see things that need to be seen that day. Some are huge, life-threatening emergencies and others are more urgent care appointments (i.e., ear infections, pets that are vomiting, etc.). These days are unpredictable. Usually there is very little time for a break and I usually don't leave the hospital until 9:00 pm or later.

Surgery days are fun! I find surgery very relaxing. I arrive at 7:30 am to meet with all the clients leaving their pets for surgery. Then I'm in surgery from 9:00 am to about 1:00 or 2:00 pm. I love just listening to music and not really talking in surgery. Then I usually do eat lunch and work on my charts, call clients back, and leave by 6:00 or 6:30 pm! Get to see my son!

11. In one to two sentences, how would you say you use bioinformatics in your work? If you don't use bioinformatics directly in your work, how has bioinformatics impacted your career field?

While we often think of genetic testing in humans, we are seeing more and more tests being developed for my animal patients, and much of the research is being done at my *alma mater*, the Washington State University (WSU) College of Veterinary Medicine. For example, WSU's Veterinary Cardiac Genetics Laboratory (VCGL) has developed a test for hypertrophic cardiomyopathy, the most common form of heart disease in cats. The test for MyBPC mutations in Ragdoll and Maine Coon cats cannot prevent the disease, which often strikes without warning when cats are three or four years old, but it can prepare cat owners for what is happening to their pet.

I'm also excited about genetic testing for drug sensitivities in dogs. This has tremendous clinical use. Some breeds such as collies and their relatives, shelties, Australian shepherds, and long-haired whippets, are known to be potentially sensitive to particular drugs, and they are not used on them in the clinic because of fear of a fatal reaction. However, genetic testing for mutations in Multi-Drug Resistance 1 (*MDR1*) gene can distinguish between those dogs that are sensitive and those that are not, informing both breeding programs and treatment options for those dogs.

I think bioinformatics research will have profound effects on breeding programs, but we have to proceed with caution. There is the example of the Cavalier King Charles spaniels, who have a genetic predisposition to a deadly congenital heart condition called Mitral Valve Disease (MVD). In the 1980s, when dog breeders tried to select for animals without MVD, they did not appreciate the small Cavalier Spaniel gene pool which inadvertently led to selection for an equally deadly congenital spinal cord defect, *Syringomyelia*. As we learn more about these genetic conditions, and cross and develop new breeds with increased genetic diversity and fitness, hopefully these problems will be reduced.

12. Do you have any recommendations for students who are interested in entering your field?

Getting into college and veterinary school is becoming more and more competitive. Really focus on academics and grades while trying to still take in some extracurricular activities to present a well-rounded candidate.

13. What are your favorite hobbies?

I love being a mom. I enjoy exercise, such as running and hiking. I love cooking and eating. Being with people I love doing anything is what it's all about. I love to travel but haven't done much as of late.

Resources:

In the **field of veterinary medicine**, there are many different types of jobs available, depending upon what type of education and experience you have. For more information about different types of jobs in this field, including what you can do with different degrees (two year Associate's degree, four year Bachelor's degree, graduate, or professional degrees), visit NWABR's Student Career Center at: <http://www.nwabr.org/students/student-resource-center/career-center>.

The site also includes descriptions of and links to different types of degree programs, various career paths, resources on writing a resume and cover letter and evaluating online resources, and tips for successful job interviews.

All of the links below can also be accessed from NWABR's Student Career Center.

To learn about **job prospects, salary information, and job skills ("qualifications")** required for veterinarians, specifically those that research ways to treat human and animal problems, visit the US Bureau of Labor Statistics: <http://www.bls.gov/oco/ocos076.htm>.

For more information about genetic testing and research with animals, visit the Veterinary Genetics Laboratory at the University of California (UC) Davis. To see the tests available for different species, click the "Test Ordering and Information" button and then select your animal of interest. To learn more about the research being done at UC Davis using genetic techniques, click on the "Research" button and then click the name of the "Investigator" who works on your species of interest: <http://www.vgl.ucdavis.edu/>.

See Dr. Deborah Tegarden at Elliott Bay Animal Hospital: <http://elliottbayah.aahavet.org/web1/veterinarians.aspx>.

For more information about the Veterinary Cardiac Genetics Laboratory at Washington State University, visit: <http://www.cvm.ncsu.edu/vhc/csds/vcgj/index.html>.

About.com offers a Career Brief for Veterinarians: <http://careerplanning.about.com/od/occupations/p/veterinarian.htm>.


Some of the Resources above may also be used to research other careers that may be of interest to you in the future, including the Bureau of Labor and Statistics and the National Human Genome Research Institute.

Job Posting: Veterinary Genetic Research Summer Internship

The laboratory of Dr. Harriet Atman is looking for motivated individuals interested in learning about genetic risk factors for hip dysplasia in dogs. Hip dysplasia is the leading cause of painful arthritis in dogs, and is known to be a polygenic trait (involving multiple genes). Interns will work closely with lab members and help identify dogs to include in our research studies, analyze dog DNA samples, and help present research findings to other members of the veterinary genetic testing community. Prior lab experience is not necessary, but an understanding of molecular biology, including the role of DNA in encoding physical traits, is required. Applicants familiar with genetic testing and bioinformatics tools used to detect mutations are encouraged to apply. Additional computer skills, including Microsoft Office (Word®, Excel®, PowerPoint®), are preferred. Demonstrated experience of working closely with animals in the home, animal shelters, or other areas is particularly valuable. If applicants are interested in genetic research but do not enjoy working with animals, we suggest applying for an internship in the lab of Dr. Leo Frankos in the Department of Applied Genetic Research. Applicants must be hard-working, responsible, and able to work in a team environment. Address all inquiries to Dr. Harriet Atman, Seattle Research University, Veterinary Research Department, Suite 200, Seattle, WA.

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Robin Bennett, MS
Genetic Counselor

 <p>GENETIC COUNSELOR ROBIN BENNETT, MS</p> <p>Place of Employment: University of Washington</p> <p>Specialties: Huntington's disease, neurogenetics, cancer genetics, genetic family history, and ethical issues in genetic counseling and genetic testing</p> <p>"I feel privileged to be a part in some small way with each of my patients and that hopefully I have helped them with some difficult decisions and with making choices that work for them within their belief systems."</p>	<p>CAREERS IN SPOTLIGHT: GENETIC COUNSELOR</p> <p>What do they do?</p> <ul style="list-style-type: none"> • Review a patient's medical and family history. • Advise patients and their families about the benefits and consequences of genetic testing, and about the nature of genetic disorders. • Offer counseling consistent with the patient's belief system. <p>What kind of training is involved? Bachelor's degree and a two to three year Master's degree.</p> <p>What is a typical salary for a Research Scientist? Start at \$60,000/year (\$29/hour), and may make up to \$120,000/year (\$58/hour).</p>
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1. Where did you grow up?

I grew up on Mercer Island in Washington State and attended Mercer Island High School.

2. What do you do (i.e., what career or field are you in, what is the title of your position)?

I am a Senior Genetic Counselor and Co-Director of the Genetic Medicine Clinic at the University of Washington.

3. How did you choose your career? When did you first know this was the career you wanted?

I really hadn't cared too much for science until I had a wonderful biology teacher in tenth grade, Mr. Bill Tougaw. He taught science by telling stories and I was fascinated. He taught a course in Embryology and I was hooked. The field of genetic counseling was just starting. Once I learned about genetic counseling I knew it was the perfect fit because I could work in the fields of medicine and psychology but have more flexibility with my schedule to raise a family. I loved that the field was changing so rapidly that there were always new things to learn. This is still what I love most about being a genetic counselor almost 30 years later. I am honored to be among the first genetic counselors in the world and to have been a part of the growth of genetic counseling as a career.

4. Did your family support your decision to pursue your career?

Some days I feel that they still don't understand exactly what I do, but they were very supportive of my education and continue to support me in my career.

5. What is the highest level of education you have?

Currently, genetic counseling is a two year Master's Degree which is required from a program that is accredited by the American Board of Genetic Counseling. In the next five years there are likely to be Clinical Doctorate programs in genetic counseling which will probably be three years in duration. This change will allow genetic counselors more flexibility in seeing complex patients and reflects how complicated it has now become to provide genetic counseling because of the range of genetic tests now available.

6. What is the highest level of education reached by other members of your family?

My family is well-educated in unusual things! My father has a Master's in engineering and was a test pilot. My paternal grandfather was a family physician and my paternal grandmother was the nurse in his home office. My mother has a PhD in folklore. My sister has a PhD in mathematics and my brother has a Master's in plastic engineering.

7. What is the salary range for a person in your position?

It varies with experience but usually starts at about \$60,000 annually [\$29/hour] and some genetic counselors make at least \$120,000 annually [\$58/hour], plus benefits.

I suggest that you look at the professional salary survey for the National Society of Genetic Counselors for salary information at <http://www.nsgc.org>.

8. What do you like most about your job?

I learn so much from the people I counsel. I am inspired by the ways that they cope with such difficult problems that influence not only them but their whole family. I feel privileged to be a part in some small way with each of my patients and that hopefully I have helped them with some difficult decisions and with making choices that work for them within their belief systems. I love learning something new every day. I have never once had a boring day at work! I find genetic counselors to be very inquisitive and caring people. Usually I attend a genetics meeting once or twice a year for a few days; not only is it fun to see a new city but I love to be with my genetic counseling colleagues and learning from each other.

9. What do you like least about your job?

I am very sad when a patient dies, but even then I usually have learned something from the experience. All health care positions have too much paperwork and processes. I have trouble with administrators who seem more focused on their processes than the big picture of what helps patients and their families. Although genetic counselors are becoming more recognized on the health care team, it is still a relatively small profession. It can be hard to explain that you are not a generic counselor or a geriatric counselor.

10. What's an abbreviated day in the life of your job?

Most genetic counselors see patients two to three days a week, with four to eight patients daily. At a patient visit, we obtain family history information and draw a family pedigree. The pedigree is analyzed for patterns of inheritance and psychosocial clues to help the patient (for example, a patient may be particularly anxious about developing a disease like breast or colon cancer because he or she is now the age at which a relative also developed cancer). We would discuss genetic testing options, implications of the disease, ethical issues, and if testing is done, make a plan for disclosing test results (either by a return visit or a telephone appointment). Usually a summary letter is sent that includes recommendations to see other relatives. The rest of the time is spent following up on test results, researching genetic diseases, and often attending lectures to keep up in the field. Many genetic counselors give talks in the community about their work and often participate in research studies.

These studies might involve disease registries, looking at psychological issues, performing patient surveys, etc. I have been fortunate in being able to write many book chapters and even my own book. I have been able to give talks in Australia, Saudi Arabia, and Europe. I also volunteer in many ways for my profession including serving on various boards related to my profession (such as for the National Society of Genetic Counselors, the American Board of Genetic Counseling, and the American Society of Human Genetics).

11. In one to two sentences, how would you say you use bioinformatics in your work? If you don't use bioinformatics directly in your work, how has bioinformatics impacted your career field?

Genetic counselors are totally dependent on databases that help interpret genetic testing results, risk models for disease prediction, and electronic reviews in the medical and psychological literature. All medical records are or will soon be electronic. There are unique issues around electronic medical records in genetics because they may interface with records of other relatives.

12. Do you have any recommendations for students who are interested in entering your field?

Currently, the number of genetic counseling programs is still limited and thus they are quite competitive. It is good to get some experience (volunteering is fine) making sure you like working with people, especially people who can have quite severe problems. Working or volunteering in a hospital or other medical setting is important (it doesn't have to be with people with genetic diseases). Ideas include Planned Parenthood, a crisis phone line, a hospice, patient escort, even volunteering to do paperwork in a genetic clinic office. Most genetic counselors are happy to speak to you about what they do. It is good to talk to genetic counselors who work with different populations, such as those in prenatal genetics (working with pregnant patients), cancer genetics, and pediatric genetics. The National Society of Genetic Counselors has excellent materials on their website about genetic counseling including salary/job surveys (<http://www.nsgc.org>). The American Board of Genetic Counseling has information about the schools accredited to provide genetic counseling and the competencies needed to be a genetic counselor (<http://www.abgc.net>).

13. What are your favorite hobbies?

Is eating chocolate a hobby? I play the harp and piano, sew, swim, do needlework, garden, walk my dog, and hang with my family and friends.

Resources:

In the **field of genetic counseling**, there are many different types of jobs available, depending upon what type of education and experience you have. For more information about different types of jobs in this field, including what you can do with different degrees (two year Associate's degree, four year Bachelor's degree, graduate, or professional degrees), visit NWABR's Student Career Center at: <http://www.nwabr.org/students/student-resource-center/career-center>.

The site also includes descriptions of and links to different types of degree programs, various career paths, resources on writing a resume and cover letter and evaluating online resources, and tips for successful job interviews.

All of the links below can also be accessed from NWABR's Student Career Center.

The Commonwealth of Virginia has a "Career Guide for Genetic Counselors" that details the **skills, knowledge, abilities, and tasks** required to be a genetic counselor, as well as information on **education and training**. For more information, visit: <http://jobs.virginia.gov/careerguides/geneticcounselor.htm>.

Find information on careers in genetic counseling at the National Human Genome Research Institute, including information about **career outlook, working conditions, and salary**. Scroll through the career listings until you reach "Genetic Counselor" on page 2: <http://www.genome.gov/GenomicCareers/careers.cfm>.

The US Bureau of Labor and Statistics offers a little information about genetic counselors: <http://www.bls.gov/oco/ocos047.htm>.

Visit the National Society of Genetic Counselors for more information about genetic counseling and salaries:
<http://www.nsgc.org>.

Robin Bennett's homepage: http://depts.washington.edu/medgen/faculty/Robin_Bennett.shtml.


Some of the Resources above may also be used to research other careers that may be of interest to you in the future, including the Bureau of Labor and Statistics, and the National Human Genome Research Institute.

Job Posting: Genetic Counselor Assistant Summer Internship

The genetic counseling clinic of Dr. Margaret Parry-Perkins is looking for motivated individuals interested in learning about genetic counseling and testing for genetic conditions. Our clinic works with patients who have a history of genetic disease in their family. We help patients understand the genetic testing process and what their results mean. Interns will work closely with counselors and laboratory technicians who analyze the patient samples. Prior lab experience is not necessary, but an understanding of molecular biology, including the role of DNA in encoding physical traits, is required. Applicants familiar with genetic testing and bioinformatics tools used to detect mutations are encouraged to apply. Additional computer skills, including Microsoft Office (Word®, Excel®, PowerPoint®), are preferred. Demonstrated ability to communicate well with others, listen to the needs of others, and explain complex topics in an easy-to-understand way is particularly valuable. If applicants are interested in genetic research but do not enjoy working with patients, we suggest applying for an internship in the lab of Dr. Leo Frankos in the Department of Applied Genetic Research. Applicants must be hard-working, responsible, good communicators, and able to work in a team environment. Address all inquiries to Dr. Margaret Parry-Perkins, Seattle Research University, Genetic Counseling Clinic, Suite 300, Seattle, WA.

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Zane Kraft, MS
Laboratory Technician

 <p>LABORATORY TECHNICIAN ZANE KRAFT, MS</p> <p>Place of Employment: Seattle Biomedical Research Institute</p> <p>Type of Work: HIV Vaccine Research</p> <p>"We do a lot of DNA alignments of HIV Envelope sequences. Another fun thing that we now do more of is computer modeling of HIV Envelope proteins with different mutations."</p>	<p>CAREERS IN SPOTLIGHT: LABORATORY TECHNICIAN</p> <p>What do they do? Laboratory technicians, sometimes called "lab techs" or research technicians, do much of the day-to-work in the lab, including purifying and sequencing DNA, caring for laboratory machinery, and analyzing samples.</p> <p>What kind of training is involved? Some laboratory technicians have a two year Associate's degree or a four year Bachelor's degree. Some, like Zane Kraft, also have a Master's degree (additional two year training).</p> <p>What is a typical salary for a Research Scientist? Ranges with experience from \$30,000/year (\$14/hour) up to \$60,000/year (\$29/hour) or more.</p>
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1. Where did you grow up?

I grew up in the Seattle area, in Kent, Washington to be exact. I went to Kentwood High School and for college I went to Central Washington University.

2. What do you do (i.e., what career or field are you in, what is the title of your position)?

I am a research technician, also called a laboratory technician, in an HIV vaccine lab at Seattle Biomed, a non-profit research institution in Seattle. I do a lot of different things in the lab – molecular biology, protein analyses, and cell-based assays.

3. How did you choose your career? When did you first know this was the career you wanted?

I think it all started in undergrad. Like so many others, I wanted to be an MD, and took lots of biology courses. I was in microbiology and went to talk to the professor and asked her what kind of work she was doing. I ended up liking it so much, I decide I wanted to keep on doing it!

4. Did your family support your decision to pursue your career?

Yes, definitely. The whole MD thing may have seemed much sexier, but overall they were very supportive.

5. What is the highest level of education you have?

I have a BS in biology with an emphasis in microbiology, and a Master's in biology. Both are from Central Washington University.

6. What is the highest level of education reached by other members of your family?

Bachelor's degrees. I don't think we have any PhDs in the family that I can think of.

7. What is the salary range for a person in your position?

For the non-profits, which is what I can attest to, the starting salary is at about \$30,000 [\$14/hour] and the upper limit is about \$65,000 [\$31/hour] – a pretty wide range, depending on educational background and years of experience.

8. What do you like most about your job?

Well, obviously, every lab is a little different, but my boss is pretty flexible, and lets us venture out on our own ideas and test some of them. The flexibility of the hours is common with most labs, as long as you get the work done. You come in when you want and leave when you need to. And you're always learning new stuff.

9. What do you like least about your job?

Obviously I wish it paid more. Being in the HIV vaccine field, there are also a lot of disappointments. I think I have a thick skin now.

10. What's an abbreviated day in the life of your job?

This is always such a tough question, because every day is so different. On the average day, I come in, set up some PCR reactions [polymerase chain reaction], and then do a cell-based assay. Later on I'll probably do some data analysis, some number crunching and basic statistics, and prepare graphs of my data.

11. In one to two sentences, how would you say you use bioinformatics in your work? If you don't use bioinformatics directly in your work how, has bioinformatics impacted your career field?

We do a lot of DNA alignments of HIV Envelope sequences. Another fun thing that we now do more of is computer modeling of HIV Envelope proteins with different mutations. With the new grant from the Gates Foundation, we're looking at protein scaffolds that mimic specific structures of Envelope that we could use as vaccines, and how they react to monoclonal antibodies we have in the lab. It's all done with computer models.

12. Do you have any recommendations for students who are interested in entering your field?

One thing I always hammer into all of our interns is, if they are interested in science, when they get into college, they should seek out labs that have research opportunities. Whether you're working for free or if you're lucky enough to be with a lab that will pay you, the experience helps you immensely later on. When we hire, that's one thing we screen for—what type of research they did as an undergrad. It's amazing how many students coming out of college have no research experience.

13. What are your favorite hobbies?

I like to rock climb in my spare time; that's my biggest hobby, and hiking – outdoor things. I would love for traveling to be a bigger hobby. The flexibility with my work schedule helps a lot with my hobbies – sometimes I can sneak out at 3:00 pm to go to the gym.

Resources:

In the **field of laboratory research**, there are many different types of jobs available, depending upon what type of education and experience you have. For more information about different types of jobs in this field, including what you can do with different degrees (two year Associate's degree, four year Bachelor's degree, graduate, or professional degrees), visit NWABR's Student Career Center at: <http://www.nwabr.org/students/student-resource-center/career-center>.

The site also includes descriptions of and links to different types of degree programs, various career paths, resources on writing a resume and cover letter and evaluating online resources, and tips for successful job interviews.

All of the links below can also be accessed from NWABR's Student Career Center.

To learn about **job prospects** and **salary information** for science technicians, visit the US Bureau of Labor Statistics: <http://www.bls.gov/oco/ocos115.htm>.

The Commonwealth of Virginia has a "Career Guide for Biological Technicians" which details the **skills, knowledge, abilities, and tasks** required to be a biological or laboratory technician, as well as sample career path for a technician, beginning with a Laboratory Aide and ending with a Laboratory Manager. For more information, visit: <http://jobs.virginia.gov/careerguides/BiologicalTechs.pdf>.

To read a Seattle Times article about the work Zane Kraft does, visit: http://seattletimes.nwsources.com/html/localnews/2003139170_aids20m.html.

About.com offers a Career Brief for Laboratory Technicians, which includes short summaries about required **education, job outlooks, salary, and "a day in the life"** of a Laboratory Technician: <http://careerplanning.about.com/od/occupations/p/laboratory-technician.htm>.

Some of the Resources above may also be used to research other careers that may be of interest to you in the future, including the Bureau of Labor and Statistics and the National Human Genome Research Institute.

Job Posting: Genetic Research Summer Internship


The laboratory of Dr. Leo Frankos is looking for motivated individuals interested in learning about genetic risk factors for bone cancer in young people and applied genetic research. Cancer is a complex disease, and our lab is working to identify genes that contribute to a higher risk for bone cancer, as well as genes that appear to protect people from developing bone cancer. We also develop cancer treatments, also called cancer therapeutics, in which we try to apply our genetic research findings directly to patient care. Interns will work closely with lab members and help analyze DNA samples, including DNA sequence analysis, and help present research findings to other members of the bone cancer research community. Prior lab experience is not necessary, but an understanding of molecular biology, including the role of DNA in encoding physical traits, is required. Applicants familiar with genetic testing and bioinformatics tools used to detect mutations are encouraged to apply. Additional computer skills, including Microsoft Office (Word®, Excel®, PowerPoint®), are preferred. Demonstrated experience of commitment and a willingness to learn new things is particularly valuable. Applicants must be hard-working, responsible, and able to work in a team environment. Address all inquiries to Dr. Leo Frankos, Seattle Research University, Department of Applied Genetic Research, Suite 400, Seattle, WA.

LESSON 7

CLASS SET

7 Beth Anderson

3D Animator

 <p>3D ANIMATOR BETH ANDERSON</p> <p>Place of Employment: Arkitek Studios</p> <p>Type of Work: Develops 3D animations that help scientists and students visualize biological processes.</p> <p>"Bioinformatics interfaces in many ways with our work, from data that clients give us to visualize representationally, to creating actual visual data."</p>	<p>CAREERS IN SPOTLIGHT: 3D ANIMATOR</p> <p>What do they do? 3D animators are visual communicators and designers. The animations and illustrations they create help communicate scientific content and ideas to scientists, students, and educators.</p> <p>What kind of training is involved? Associate of Arts degree. Some also have training in biology, illustration, graphic design, and computer animation.</p> <p>What is a typical salary for a Research Scientist? Ranges with experience from very little when people are first starting out to \$100,000/year (\$48/hour) or more.</p>
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1. Where did you grow up?

Oak Ridge, Tennessee, Atomic City, USA.

2. What do you do (i.e., what career or field are you in, what is the title of your position)?

3D Animator and business owner. Officially I'm CEO and co-founder of Arkitek Studios, a visual communications design group specializing in content development for the science, technology, and education communities.

3. How did you choose your career? When did you first know this was the career you wanted?

When I was working for my father in his biotech company, building biotech equipment, I learned AutoCad, knew that I wanted to make things move.

4. Did your family support your decision to pursue your career?

Yes, but I was stubborn. I put myself through school (and am still paying for it!).

5. What is the highest level of education you have?

AA – Associate of Arts, Art Institute of Seattle.

6. What is the highest level of education reached by other members of your family?

Father – PhD in Biochemistry, Duke University. Brother Leigh – PhD in X-Ray Crystallography from Cambridge, under Max Perutz.

7. What is the salary range for a person in your position?

Oh boy, that's a loaded one. Anywhere from nothing when people are first starting out, building their business, to six figures and beyond. I'm sad to say I am not in that category.

8. What do you like most about your job?

It's different every day.

9. What do you like least about your job?

It's different every day. Sometimes I would like a job I didn't have to think about so hard.

10. What's an abbreviated day in the life of your job?

Check email around 7:00 am, get into work around 9:00 am, check email and work with clients for an hour, then hop onto any administrative work that needs to be done, then have lunch. Then work on production until it's time to go home, around 6:30 pm. I'm very proud to say that we now actually **stop** working around 6:30 pm; it used to be 10:00-11:00 pm before we stopped.

11. In one to two sentences, how would you say you use bioinformatics in your work? If you don't use bioinformatics directly in your work, how has bioinformatics impacted your career field?

Bioinformatics, or list biology, as it was originally termed, interfaces in many ways with our work, either from data that clients give us to visualize representationally, or to create actual visual data.

12. Do you have any recommendations for students who are interested in entering your field?

- You'll never learn anything you won't find you use later on, no matter how esoteric or boring you think it is now. I have proven that to myself countless times.
- Technology and technique are cool things, but they will be useless if you can't communicate well with other people, or if you don't actually **care** about how others see the world. I've seen way too many talented people who don't play well with others sabotage themselves personally and professionally by not thinking about the other guy. Compassion trumps all.

13. What are your favorite hobbies?

Motorcycles, dogs, books, learning something new every day no matter how insignificant, travel, making people I don't know smile.

Resources:

In the **field of animation**, there are many different types of jobs available, depending upon the type of education and experience you have. For more information about different types of jobs in this field, including what you can do with different degrees (two year Associate's degree, four year Bachelor's degree, graduate, or professional degrees), visit NWABR's Student Career Center at: <http://www.nwabr.org/students/student-resource-center/career-center>.

The site also includes descriptions of and links to different types of degree programs, various career paths, resources on writing a resume and cover letter and evaluating online resources, and tips for successful job interviews.

All of the links below can also be accessed from NWABR's Student Career Center.

To learn about **job prospects** and **salary information** for multi-media artists and animators, visit the US Bureau of Labor Statistics: <http://www.bls.gov/oes/current/oes271014.htm>.

Find information on medical illustration at the National Human Genome Research Institute, including information about **career outlook**, **working conditions**, and **salary**. Scroll through the career listings until you reach "Medical Illustrator" on page 3: <http://www.genome.gov/GenomicCareers/careers.cfm>.

About.com offers a Career Brief for Animators, including **employment facts**, **job requirements**, and **salary information**: <http://careerplanning.about.com/od/occupations/p/animation.htm>.

AllArtSchools also offers information about careers in animation, including **job skills needed to be an animator**, and assistance in **finding a school that offers programs in animation**. Visit: <http://www.allartschools.com/faqs/animation-career>.

Beth Anderson's company is called Arkitek Studios. Visit their homepage at: <http://www.arkitek.com/>.

Some of the Resources above may also be used to research other careers that may be of interest to you in the future, including the Bureau of Labor and Statistics and the National Human Genome Research Institute.


Job Posting: Biological Animation Summer Internship

The studio of Ms. Anne Gottsling is looking for motivated individuals interested in learning how to develop 3D animations to help high school students learn about biology. Research on education and learning supports the theory that students learn better by doing biology instead of just reading about it in textbooks. However, not all science classes have the facilities to perform all types of laboratory experiments. Ms. Gottsling is developing "virtual laboratories" for students to perform experiments using computers. The current project explores laboratory experiments that are performed with patient samples and genetic testing, including DNA purification, DNA sequencing, and bioinformatics analyses. Prior lab experience is not necessary, but an understanding of molecular biology, including the role of DNA in encoding physical traits, is required. Applicants familiar with genetic testing and bioinformatics tools used to detect mutations are encouraged to apply. Additional computer skills, including Microsoft Office (Word®, Excel®, PowerPoint®), are preferred. Demonstrated artistic experience or ability, as well as a willingness to learn new things, is particularly valuable. Applicants must be hard-working, responsible, and able to work in a team environment. Address all inquiries to Ms. Anne Gottsling, Seattle Research University, Biological Animations Studio, Suite 500, Seattle, WA.

LESSON 7

CLASS SET

7 Kelly Edwards, PhD Bioethicist

	<p>BIOETHICIST KELLY EDWARDS, PhD</p>	<p>CAREERS IN SPOTLIGHT: BIOETHICIST</p>
<p>"Genetics researchers often work with distinct communities. To take moral account of how their research affects these communities, they need a richer conception of justice and they need to make those communities equal participants in decision-making about how the research is conducted and what is produced and published out of it."</p>	<p>Place of Employment: University of Washington</p> <p>Specialties and Interests: Community-based research practices, environmental justice, and integrating ethics into training programs and public policy.</p>	<p>What do they do? Bioethicists study the ethical controversies that arise from advances in biology and medicine. They advise patients, researchers, public policy makers, and/or medical doctors about a wide range of ethical issues, from genetic testing and medical treatment to medical privacy and stem cell research.</p> <p>What kind of training is involved? Training varies widely from a certificate program completed during or after a Bachelor's degree in another subject to Doctoral (PhD) programs specifically in Bioethics.</p> <p>What is a typical salary for a Research Scientist? Depending upon training, anywhere from \$50,000/year (\$24/hour) to over \$100,000/year (\$48/hour).</p>

1. Where did you grow up?

I grew up in Federal Way, Washington. My family is fourth generation Washington State, and we would spend summers visiting our family cabin in the Blue Mountains outside of Walla Walla or my family's property up the Teanaway River Valley outside of Cle Elum. I love this state!

2. What do you (i.e., what career or field are you in, what is the title of your position)?

I am on faculty in the Bioethics Department in the School of Medicine and also the School of Public Health. I am in a grant-funded faculty position, which means I am involved with a number of research projects and teaching efforts which makes for a really interesting mix of issues in ethics of medicine and science.

3. How did you choose your career? When did you first know this is the career you wanted?

It really surprised me. I went to Occidental College in Los Angeles and they emphasized building writing and critical thinking skills. They asked us to sign up for "freshman writing seminars" by choosing from a list of topics the faculty there were passionate about teaching. Not knowing anything, I selected "Personal Identity, Immortality, and the Meaning of Life." It turned out to be taught by a philosophy professor and was all about death and dying. This was 1985 and I had never heard of "bioethics" – it was hardly yet a field – but some major landmark cases were going on in that decade that were pushing the issues of when should we withdraw or withhold life-sustaining treatment from someone. Medicine and technology had progressed to the point where we had to ask not just can we do this, but should we. I was captivated by these questions, as it was the first time I had been faced with questions where there was no clear right answer. That hooked me. I ended up majoring in philosophy (which my dad said would only set me up for being a bartender ☺), but did not realize bioethics could actually be a career to pursue until four years after college, when I was encouraged to look at the MA in Bioethics program at the University of Washington.

4. Did your family support your decision to pursue your career?

Absolutely. Despite the funny remark from my dad above, they have always supported me and my sister in pursuing our passions and interests, as long as we find our own way to make a contribution to the world. (My sister is in environmental education and ecotourism in Alaska.)

5. What is the highest level of education you have?

PhD in Philosophy of Education.

6. What is the highest level of education reached by other members of your family?

My Dad has a MBA, and my mom had a BA until she went back for her BSN in her 40s. Her father was a general surgeon. My family has always valued education and appreciated there were a variety of ways to contribute to the world.

7. What is the salary range for a person in your position?

It depends on the university and geographic region, and your seniority and experience. Starting salary for a junior faculty in bioethics can be \$60,000-\$80,000 [\$29-\$38/hour] and our more senior faculty at UW (who are PhDs but not MDs) are in the range of \$90,000-120,000 [\$43-\$58/hour].

8. What do you like most about your job?

I feel very lucky for my job and I like a number of things about it. One is the flexibility to work on a number of different projects and issues. The work is always evolving and emerging along with issues in science and medicine so we are always learning. I also love the people that I work with – all my work occurs in interdisciplinary teams.

9. What do you like least about your job?

It can be stressful to be a grant-funded faculty member, as you have to be constantly on the lookout for the next funding opportunity. In the current funding climate, federal funds are very competitive. This means you can spend a lot of your time writing grants with no guarantee of being successful. Our group has been very lucky and I've been fully funded for the ten years I have been in this position. Because the work never ends, you have to be willing and able to draw boundaries to make sure you are still taking care of yourself and making time for exercise, friends, and family.

10. What's an abbreviated day in the life of your job?

Every day is really different (hence the variety I like), but here's an example: Get up at 6:00 am and respond to email for about an hour or two. Bike to my first meeting, which could be in one of three research buildings around the city. Have a series of meetings with research teams, or some of our clinical teachers at the medical school about teaching approaches for ethics and professionalism with the medical students, or with hospital staff and leadership about if and how we should use clinical data for research purposes. I might give a guest lecture on ethics to one of several graduate seminars or medical groups, then bike home, sometimes via the yoga studio. Often my days are filled with meetings so I need to do my own writing in the evenings. And then get up and see what's on the calendar for the next day!

11. In one to two sentences, how would you say you use bioinformatics in your work? If you don't use bioinformatics directly in your work, how has bioinformatics impacted your career field?

I collaborate actively with colleagues in our Biomedical Health Informatics Core within our Institute for Translational Health Sciences. We are interested in the use of health information in research, how to do data sharing effectively and ethically, and how technical systems can help support ethical biobanking practices. For example, using computer interfaces to manage participant preferences and information flow in a research project.

12. Do you have any recommendations for students who are interested in entering your field?

Be creative and curious. All fields have ethical dimensions to their work, so you can have a subspecialty in ethics even if you are focusing on a different area of work. As an emerging field, you can create your own path in bioethics (there is not a set career path). We come from many different core disciplines: philosophy, theology, health services, anthropology, sociology, biology, public health, law, etc.

13. What are your favorite hobbies?

I love being outside in any form. I love backpacking in our Cascade Mountains and skiing or snowshoeing in the winter. My sister is teaching me how to telemark ski so I can get into the backcountry. I also enjoy finding interesting urban spaces for picnics and listening to live music.

Resources:

In the **field of bioethics**, there are many different types of jobs available, depending upon what type of education and experience you have. For more information about different types of jobs in this field, including what you can do with different degrees (two year Associate's degree, four year Bachelor's degree, graduate, or professional degrees), visit NWABR's Student Career Center at: <http://www.nwabr.org/students/student-resource-center/career-center>.

The site also includes descriptions of and links to different types of degree programs, various career paths, resources on writing a resume and cover letter and evaluating online resources, and tips for successful job interviews.

All of the links below can also be accessed from NWABR's Student Career Center.

Find information on careers in bioethics and genomics at the National Human Genome Research Institute, including **career outlooks, working conditions, and salary information**. Scroll through the career listings until you reach "Bioethicist Using Genomics" on page 1: <http://www.genome.gov/GenomicCareers/careers.cfm>.

To learn about **careers in bioethics**, visit: <http://bioethics.virginia.edu/careers.html>.

For more information about reliable bioethics career resources visit "Bioethics Resources of the Web" at: <http://bioethics.od.nih.gov/careers.html>.

Dr. Kelly Edwards's homepage: http://depts.washington.edu/bhdept/facres/kfe_bio.html.

Some of the Resources above may also be used to research other careers that may be of interest to you in the future, including the Bureau of Labor and Statistics and the National Human Genome Research Institute.

Job Posting: Bioethics Summer Internship

The Bioethics Group at Seattle Research University, under the leadership of Dr. MaryEllin Sundberg, is seeking motivated individuals interested in bioethical and policy issues related to direct-to-consumer (DTC) genetic testing. Direct-to-consumer genetic testing refers to genetic tests that are marketed directly to consumers, such as through the internet, without involving a doctor or insurance company. While advocates claim that this allows consumers greater access to their own genetic information, critics are concerned that the public is not fully educated about the risks such information can bring, or the clinical validity of DTC genetic testing results. The Bioethics Group will be hosting focus groups with community groups on issues related to DTC genetic testing, and will develop a report summarizing our findings, which will be submitted to the United States Congress to inform future public policy debates. Prior lab experience is not necessary, but an understanding of molecular biology, including the role of DNA in encoding physical traits, is required. Applicants familiar with genetic testing, DTC genetic testing, and bioinformatics tools used to detect mutations are encouraged to apply. Additional computer skills, including Microsoft Office (Word®, Excel®, PowerPoint®), is preferred. Interest in bioethics and familiarity with bioethical principles is required. Demonstrated ability to communicate well with others, listen to the needs of others, and explain complex topics in an easy-to-understand way is particularly valuable. Applicants must be hard-working, responsible, and able to work in a team environment. Address all inquiries to Dr. MaryEllin Sundberg, Seattle Research University, Bioethics Group, Suite 600, Seattle, WA.

LESSON 7

CLASS SET