BME Jobs to Climb by 26.1 Percent...The number of biomedical engineering jobs will climb almost twice as fast as the overall average for a 26.1 percent gain by 2012, according to the government’s new long-range forecast. Overall job growth is projected to be 14.8 percent, according to the U.S. Bureau of Labor Statistics (BLS). The bureau’s growth projections have declined slightly since the last national survey two years ago. At that time, the government foresaw a 31.4 percent increase in biomedical engineering jobs over 10 years and a 15.2 percent overall growth. The new report released last month counted 7,600 biomedical engineering jobs in the United States as of 2002 and projected that number to exceed 10,000 by 2012. Thirty-eight percent of all biomedical engineers counted in the government survey worked in manufacturing industries, principally in pharmaceutical and medicine manufacturing and in industries that make medical instruments and supplies. Other big employers are hospitals and government agencies.

As it stands, biomedical engineers earned a median annual income of $60,410 in 2002. The middle 50 percent earned between $58,320 and $88,830. The lowest 10 percent earned less than $48,450, and the highest 10 percent earned more than $107,520, the report said. The BLS cited a 2003 salary survey by the National Association of Colleges and Employers showing that bachelor’s degree candidates in biomedical engineering received employment offers averaging $39,126 a year, while master’s degree candidates considered offers of about $61,000. Go to www.whitaker.org for more information.

Whitaker Awards Final Building Grants...The Whitaker Foundation has completed its final round of Special Awards for building construction and five universities will share $17 million. A $5 million grant went to Purdue University and $3 million each to the University of Rochester, Rutgers, State University of New York Stony Brook, and to the University of Texas Austin. The Whitaker building grants have enabled 38 universities to establish biomedical engineering departments and enhanced dozens of other departments and programs across the U.S.

NIBIB Wants Your Response to Strategic Plan...The National Institute of Biomedical Imaging & Bioengineering (NIBIB) is looking for comments from the biomedical engineering community on their strategic plan. Please go to www.nibib.nih.gov to review the strategic plan or send your comments to nibib_sp@mail.nih.gov.

Free Annals Back Issues Available to Chapters

BMES began 2004 with a new publisher for the *Annals of Biomedical Engineering*. As a result, we have a supply of back issues of the journal beginning with 1997-98 issues. If your BMES Student Chapter is interested in obtaining a set of back issues of the journal and you are willing to pay the shipping cost of approximately $15, please contact Pat Horner at the BMES headquarters office, 301-459-1999, or via email at pat.horner@bmes.org. We will make these back issues available until May 15 at which time we will discard the excess inventory.
In this issue I would like to focus on some example career paths of Biomedical Engineers. Since I am involved with many undergraduate and graduate students, I often get questions about what can you do with a Bioengineering Degree. Students should begin asking this question before they start in an academic program. When applying to a University, inquire about where their graduates typically go geographically, what kinds of jobs they hold, and what companies actively recruit from the program. If you plan to go into industry this information can be critical. While job hunting is not as difficult for BME students as it was 5 years ago, having a program with ties to local and national industry may increase your chances of landing a great job directly out of school.

Once you have started a program, you should explore the options open to you and decide what direction you would like to go. Often you are asked to specialize even at the undergraduate level, so it is important to look into what interests you as early as possible. I suggest students make an effort to go on tours of local medical device and biotechnology companies. Seek out alumni and talk with them about their positions. Try to do at least one internship before you graduate and by all means don’t leave your career exploration until the last semester of your senior year! You will find this is not only too late, but you will rarely have the time or energy during this semester to cram in exploration and an active job search.

Here are a few examples of what some recent BME graduates have done with their degrees in industry:

- Research and Development positions for companies working in tissue engineering of skin and working with cardiac vascular grafts. These engineers work to develop new products and improve existing products for ground breaking medical advancements.
- Quality Engineering positions for products such as surgical sutures and pacemakers. These engineers ensure that medical devices meet FDA standards for safety and efficacy.
- A Biomechanical Engineering position for a company that manufactures automotive safety devices. This engineer works to analyze the forces on the body that are sustained during automobile crashes.
- Manufacturing Engineering positions for companies that produce ultrasound equipment and vascular grafts. These engineers ensure that medical devices are manufactured in a cost-effective and efficient manner.
- Sales Engineering positions for companies that develop diagnostic and biotechnology equipment. These engineers use their technical expertise to relate to engineers, scientists, and doctors in the field. They may sell products directly, write technical support documents, or provide an interface between the sales staff and design engineers.
- Clinical or Field Support Engineering positions for companies that make neurological devices and pacemakers. These engineers work directly with doctors, training them on the devices and helping with new device protocols.

All of the above listed jobs were obtained by students with only a B.S. Degree. Graduate students have even more options open to them, but should take care to explore carefully their specialization. Remember that networking does not start with your job search. Build contacts and gain information early on and you will be rewarded. To help you with this process, job search workshops will be held this year at the BMES conference on Saturday October 6th. Please check the schedule for details.

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Students often ask me what kinds of companies hire Biomedical Engineers. Many students are aware of the large companies like Medtronic, GE Medical, or Johnson and Johnson, but there are thousands of companies out there that can use the skills of a Biomedical Engineer. In this issue, I would like to look at the medical device industry, which is a primary employer of Biomedical Engineers. There is not a simple classification system for this industry, but I have tried to outline some of the main areas and give a brief explanation. I have included some examples of medical device companies that have hired Biomedical Engineers or taken on interns.

Medical Device Companies

Bio-Instrumentation and Biosensors
Companies that make products to measure things such as blood pressure, blood gases, EKG, EEG, electrolytes, and blood glucose:
- LifeScan – http://www.lifescan.com
- Instrumentation Metrics – http://www.instrumentationmetrics.com
- Electrical Geodesics, Inc. – http://www.egi.com

Medical Imaging
Companies that make medical imaging equipment such as MRI, PET, ultrasound, and CAT scanners.
- Parallel Design – http://www.pardesign.com
- BrainLab – http://www.brainlab.com

Implantable and Invasive Devices
Companies that make products such as pacemakers, cochlear implants, retinal implants, artificial heart valves, stents, grafts and neurological devices.
- Guidant – http://www.guidant.com
- Microvention – http://www.microvent.com
- Thoratec – http://www.thoratec.com

Orthopedic
Companies that focus on areas such as artificial joints and limbs, orthopedic braces and rehabilitation, hip replacements, and bone healing.
- Wright Medical – http://www.wmt.com
- Smith and Nephew – http://www.smith-nephew.com
- OrthoLogic – http://www.orthologic.com

Tissue and Cellular Engineering
Companies that are using cells for the treatment of disease or creating products to replace and regenerate human tissue.
- Advanced Tissue Sciences – http://www.advancedtissue.com
- Aastrom Biosciences – http://www.aastrom.com

Diagnostics
Companies that produce products that are used to diagnose a wide variety of medical conditions.
- Diagnostic Products – http://www.dpcweb.com
- Abbott Diagnostics – http://www.abbottdiagnostics.com

In the next issue I will explore the Biotechnology industry including Genomics, Proteomics, Bioinformatics, Drug Discovery, and Biopharmaceuticals.

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In this issue I will explore the Biotechnology industry including Genomics, Proteomics, Bioinformatics, Drug Discovery, Biopharmaceuticals, and Scientific Product Suppliers. This industry has evolved in the past 10 years to include many companies that need the skills of Bioengineers. Unfortunately, most are not quite sure who you are or why they need you. It has been my experience though, once they hire Biomedical Engineers they continue to go back and hire more. So, if you are interested in working in this field you will need to explain to companies what you can do for them and how you are different from a basic scientist or other engineers.

Just as with medical device companies, there are not easy, across the board classifications for biotechnology companies. Many companies are involved in multiple areas of research and development. I am going to broadly define some key biotechnology terms for you, but please recognize that these terms sometimes hold slightly different meanings.

**Genomics** is the field involved with the determination of the complete DNA sequence for the genetic material contained in an organism’s complete genome. The human genome project has spurred a large number of companies interested in the potential for utilizing this information.

**Proteomics** includes the identification and quantification of proteins, as well as the determination of their localization, modifications, interactions, activities, and finally function (sometimes also called functional genomics).

**Bioinformatics** grew out of a need to process the large amounts of data being generated by the genomic and proteomic efforts. This field uses mathematical, statistical and computer methods to analyze biological, biochemical and biophysical data. It involves the analysis and interpretation of various types of data, including nucleotide and amino acid sequences, protein domains, and protein structures.

**Drug Discovery** is the process of creating and evaluating drugs for the safe and effective treatment of human disease. It includes identifying potential drug candidates by understanding and replicating the characteristics of successful drugs. This is done by efficiently using current knowledge databases and software programs to predict future clinical success.

**Biopharmaceuticals** are drugs that are produced using biological processes. The most classic example of this is when microorganisms or cells are used to produce a biologically active protein, such as insulin. The process takes advantage of these cells as mini protein factories and this technology has replaced the use of animal proteins or synthetic proteins when feasible. Most large pharmaceutical companies produce some of their drugs using bioprocess methods.

**Scientific Research Product Suppliers** create tools and supplies to enable others scientists and engineers to conduct their research. These companies are always trying to translate scientific knowledge into a product and to improve their current products. This is an ideal place for a Bioengineer to use his or her skills.

**Examples of Bioinformatics, Genomics, Drug Discovery, and Proteomics Companies:**

- **Affymetrix, Inc.:** www.affymetrix.com
- **Digital Gene Technologies:** www.dgt.com
- **GeneFormatics, Inc:** www.geneformatics.com
- **Incyte Genomics:** www.incyte.com
- **Informax:** www.informaxinc.com
- **Molecular Devices:** www.moleculardevices.com
- **Sequenom:** www.sequenom.com
- **Structural Bioinformatics:** www.strubix.com
- **Structural Genomix:** www.stromix.com

**Examples of Biopharmaceutical companies:**

- **Amgen:** www.amgen.com
- **Bayer Corporation:** www.bayer.com
- **Genentech:** www.gene.com
- **ICOS:** www.icos.com
- **Targeted Genetics:** www.targen.com

**Scientific Research Product Suppliers:**

- **Bio-Rad:** www.bio-rad.com
- **Invitrogen:** www.invitrogen.com
- **Promega:** www.promega.com
- **Qiagen:** www.qiagen.com

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In this issue I would like to continue bringing you some more alumni perspectives from industry. I surveyed former students from all degree levels, who are currently in many different kinds of positions. I hope this will give you an idea of the varied career paths that Biomedical Engineers can take. Each alumnus answered the five questions below:

1) Why did you choose Biomedical Engineering?
2) What is your current position and what path did you take to get there?
3) Describe some of your typical job duties.
4) What do you like best about your job?
5) What kind of advice do you have for students who want to pursue a job in industry?

Stephen P. Gray
Global Account Manager
System Sales, Millar Instruments, Inc.
B.S. Biomedical Engineering
Texas A&M University

1) My passion for a career that combined elements of medicine and engineering led me into Texas A&M’s Biomedical Engineering program. The diverse range of opportunities was also very attractive. Plus, I knew I would derive a great amount of satisfaction from helping doctors and research scientists create exciting solutions to challenges that face the medical industry.

2) My current position at Millar Instruments, Inc. is Global Account Manager - System Sales. I arrived at this position after serving as a Junior Manufacturing Engineer and then as a Design Engineer for Millar.

3) I am responsible for managing all aspects of Millar’s Domestic customer accounts for my product line (initiation, sales, tech support, etc.). I also assist in the management of Millar’s overseas customer accounts by staying in constant contact with our network of international product distributors. I also serve as product manager for my product line so I am responsible for maintaining and updating Millar’s catalog product offering and I consult on projects intended to add new products to the line. I frequently participate in medical device tradeshows at home and abroad and often I travel to customer sites to meet with doctors and researchers face-to-face as well as provide on-site technical product training.

4) I like the responsibility of maintaining positive relationships with all of my customer accounts as well as the tremendous opportunities the job offers for personal and professional growth. My job also offers exciting opportunities for international travel. In the past year I have been fortunate enough to experience the cultures of Holland, Belgium, Canada, United Kingdom, and Japan. This year I am scheduling trips to France, Austria, Germany, and New Zealand. Getting the opportunity to interact with people from so many different cultures in business and personal settings while traveling abroad is an extremely rewarding experience.

5) Breaking into the medical device industry is difficult, as there are few entry-level positions in this high-tech field and most of these positions are concentrated outside of Texas. However, do not be discouraged, the biomedical field continues to grow. Remain positive and committed and eventually the door will open for you. Organization, dedication, loyalty, and just plain old-fashioned hard work are definitely the keys to success!

Andy Stewart
Clinical Applications Specialist
Formerly with CBYON
B.S. and M.S., Biomedical Engineering
Texas A&M University

1) High school graduation was approaching and I had elected to pursue mechanical engineering at Texas A&M when a friend said he was doing Bioengineering. I had never heard of such a thing but was always interested in Biology and occasionally thought about med school. I looked into the program and the descriptions of artificial organs and biomechanics sounded interesting so I changed my path to Bioengineering.

2) When I completed undergrad, I felt like I had learned a little bit about a lot of things and did not know enough about any particular area to sell my knowledge to an employer. I had volunteered with a couple Clinical Engineering Departments at hospitals and visited Orthotics and Prosthetics companies and determined that there had to be more to this. I was sure that I didn’t want...
We were fortunate enough to get some great BME alumni to come speak to the students at a workshop last month at the annual meeting. I would like to continue this idea during the next several issues, by bringing you some more alumni perspectives from industry. I surveyed former students from all degree levels, who are currently in many different kinds of positions. I hope this will give you an idea of the varied career paths that Biomedical Engineers can take. Each alumnus answered the five questions below:

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4. What do you like best about your job?
5. What kind of advice do you have for students who want to pursue a job in industry?

**Ajay Sasikumar, Sales Representative, Ethicon**

**B.S. Bioengineering, Arizona State University**

- Not being sure of what I wanted to do in the medical field, I chose BME because it offered a very in-depth and diverse base to get started. It then offered opportunities for specialization in many different aspects of medicine.
- I am currently a sales rep for ETHICON and I deal with medical devices primarily used in surgery. I began by using my degree and internship experience to do research with MD&D companies and then chose the path that offered me the most proximity to hospitals and surgery.
- I primarily service hospitals and operating room staff with knowledge and education around ETHICON’s products. However, the most challenging aspect to my job is to show doctors and nurses new products and how their use in surgery would benefit patients.
- It is incredibly challenging and requires constant learning and self-improvement, because technology is ever changing and I have to be on par (knowledge wise) with surgeons and nurses.
- Don’t be afraid to take risks, never get comfortable because this means the challenge is gone. Take risks, but make sure they are educated risks.

**Ruth Kummerlen, Quality Manager, B. Braun Medical Inc.**

**B.S. Biomedical Engineering, Texas A&M**

- When I entered the Biomedical Engineering program at Texas A&M, I had been a critical care nurse for 10 years. While nursing, I had always wanted to influence products that were being developed for the end user (the nurse and/or patient).
- I currently work for a medical device company, B. Braun Medical. It is a global provider of health care products. The corporate global headquarters is in Melsungen, Germany. The US headquarters is in Allentown, PA. I work for the device manufacturing division in Carrollton, TX. I have worked for the company for 12 years. I started as a Technical Writer. Subsequent jobs included Clinical Support Supervisor, Customer Service Supervisor, Project Engineering Supervisor and I currently am the Quality Manager. Since obtaining my Bioengineering degree, I have earned an MBA and am a certified Quality Manager by ASQ.
- I am responsible for assuring that the design meets customer requirements. Both hardware and software is validated to assure conformance to specifications and to assure no patient safety issue inherent in the design. I have five supervisors who report to me. Their job titles explain my responsibilities. The job titles include Regulatory Compliance, Quality Assurance, Documentation, Quality Control, and Incoming Inspection/Supplier Management.
- I like the fact that I can and do impact the product that is manufactured by the Carrollton, TX facility for use by the end user (both nurses and patients).
- When you get out in the field, keep an open mind, be a sponge. What you learn in school is not necessarily what represents industry practices. School has shown that you can assimilate knowledge. Assimilate the knowledge of the industry you have entered. Never stop learning. Technology and customer requirements and expectations are not static; they are dynamic. Keep learning.

Continued on page 19
I had a very positive experience working with a biomedical engineer at a lab in the Naval Research Laboratories. The project seemed relevant, and it addressed a topic that I thought suited my skills very well. Also, I thought that the Biomedical Engineering discipline would give me exposure to a huge variety of concepts ranging from fluid mechanics to molecular biology. This suits my personality because I like to bring information from many different fields at once to solve a problem.

Currently I am research project manager at Veridian Corporation. To get to this point I received a B.S. in Chemical Engineering and participated in several research internships during the summers throughout undergrad. Immediately after graduation I started my Ph.D. work in Biomedical Engineering at the University of Virginia. At the end of my dissertation work I began work with Veridian.

I work on or manage three different projects. In one project, I am developing a new technique to analyze real-time polymerase chain reaction (PCR) data to enable reliable comparison of results from different samples. For another project, I work with our synthetic chemistry team to develop and test coatings for improving the biocompatibility of common surfaces with bacterial and human cells for a variety of applications. Finally, I am managing a project to develop an air collection/nucleic acid analysis device, which can operate on unmanned aircraft.

The fact that the results or products from our work are almost immediately used by our customers.

Use your time in school to develop a wide range of skills...from programming to laboratory work. A company values someone who can adapt and offer their skills to solve many types of problems.

Debbie Koeneman, Director of Regulatory Affairs, OrthoLogic M.S. Bioengineering, Arizona State University

Because I was interested in medicine and in helping patients, but did not want to become a doctor.

Director of Regulatory Affairs. I worked for the FDA right after finishing my master’s degree. After 3 years, I started at OrthoLogic doing both quality assurance and regulatory affairs. After about a year or so, I focused only on regulatory affairs.

Typical job duties include: keeping up on all regulation and Congressional activity that has to do with FDA regulated industry; looking over and approving product changes, labeling changes, brochures, and advertisements; working with engineers to make sure that product changes are appropriately documented and tested; working with marketing to help them develop materials that are within the law; working with our clinical group on clinical protocol development, administering clinical trials, and collecting clinical data; submitting paperwork to FDA to initiate clinical trials, get products approved, and to update product files; and occasionally going to meetings, either professional meetings or face-to-face meetings with FDA, regarding products or clinical trials.

I like that it is challenging and changes constantly.

For any student that would want to go into regulatory affairs, I would highly suggest trying to work at FDA for a first job out of college.
Writing a Resume for the Biomedical Industry
Jennifer Cubino, Boston University

Resumes are an extremely important part of the job search process; they introduce you to a potential employer and are an effective method in securing an interview. In summarizing your skills, accomplishments and education, your resume captures your areas of strength in a clear and concise format. Because employers receive hundreds of resumes, your resume must convey quickly that you are capable and competent.

The essential components of a resume include a header (contact information), education, experience, and computer skills. Some people choose to write an objective - a one-line statement informing the company of the position you desire. If you do write an objective, make sure the statement is focused in interest without being too narrow. In addition to these essential components, you may also want to include your GPA, professional affiliations, languages, interests, publications, poster presentations, course projects, relevant coursework or laboratory skills.

Many companies do not understand the skills a biomedical engineering graduate possesses. In many cases, writing a statement underneath your degree listing clarifies your skill set in a manner that is easier to comprehend, such as “Coursework emphasizes mechanical engineering.” Listing relevant coursework can also help the company understand your skills. Often, students must complete an in-depth project or thesis that encompasses many biomedical engineering skills. Listing these projects will demonstrate to companies how your skills apply to their area of interest.

Once you have established your general format, focus on your resume content. Whether you write an objective or not, you should know the types of positions you desire. Your content should reflect the skills you possess and be applicable to the position you wish to secure. Always convey the overall goal of your project or work experience and the precise methods you employed to reach your goal. Use industry language to explain HOW you accomplished your task. In some instances, it may help to include the results/conclusions of your work. Frequently, job postings are listed with keywords like ‘experience with PSPICE and signal processing.’ Whenever keywords are used in a job description, you should make sure that your resume contains those applicable skills. Companies often scan resumes for keyword hits; the more keywords present on your resume, the greater the chance your resume will be selected for a possible interview. While technical language is important, utilizing action verbs such as managed, initiated, or supervised in your job descriptions help you to stand out by showing responsibility and initiative.

Fitting your resume to an appropriate page length is always challenging. Typically, an undergraduate student should be able to fit his/her resume onto one page, while a graduate student can justify having a two page resume. If you do have a two page resume, place your contact information on both pages, number the pages and paper clip the sheets together. Never staple a resume. To scale down your resume, extend your margins to .5 all the way around, decrease your font to a size 10 and decrease the size of the spaces between lines to size 6.5 font. Just highlight the space and type in 6.5 for font size, then hit enter. Formatting is much more difficult if you use a resume template; you may want to consider taking your resume out of the template and pasting it in a general Word Document.

Most importantly, proofread! Make sure your spelling is correct, your punctuation is accurate and consistent and technical terms are used appropriately. Check for a consistent format, i.e. same bullets for the entire resume, indenting, equal margins, etc. Remember, your resume is an example of the quality of your work.

If you would like to look at example resumes, go to: http://www.bu.edu/eng/careers/students/ResumeGuide.pdf http://www.career.cornell.edu/students/search/resumes/resume.html#c

Job Negotiations
Kathy Gill, Case Western Reserve University

So you find yourself in a job search, perhaps for the first time, or unfortunately, again! You have interviewed and receive one or several offers. Now comes the part you hate - job negotiations. How much salary should I ask for, what about the benefits, can I be promoted? The questions loom. Then you remember what you need to do - review your marketability and job objective and analyze your financial needs.

When you review your marketability, you need to first ask yourself if you have specialized skills. The more specialized your skills the greater likelihood that a company is willing to pay a premium for those skills. Know what you are worth. Part of your worth is determined by your special-
Behind NYU Medical Center’s strong reputation for providing outstanding healthcare is an outstanding support team. We are now seeking a Clinical Engineer to support the medical equipment maintenance functions of our Clinical Engineering Department.

**CLINICAL ENGINEER**

We seek a full-time professional with previous hospital experience to assist the staff in performing medical equipment maintenance functions including overseeing parts, testing equipment and tool inventory. A Bachelor's degree in Biomedical Engineering or Electrical Engineering and a minimum three years of progressive experience is required. Must be certification eligible as a CBET from the International Certification Commission or willing to obtain certification within probationary period. Excellent communication skills are essential. Previous management experience is a plus.

For consideration, please forward resume and salary history to: Maritza Hernandez, Staffing Specialist, NYU Medical Center, One Park Ave., 16th Floor, NY, NY 10016. Fax: (212) 404-3897. Email: NYUMC-AlliedHealth@msnyuhealth.org (indicating job title in subject area). We are an equal opportunity employer.

[www.nyumedicalcenter.org](http://www.nyumedicalcenter.org)
The Institute of Biomaterials and Biomedical Engineering is part of three Faculties: Applied Science and Engineering, Dentistry and Medicine. More information on the Institute can be found at www.utoronto.ca/ibbme and The Edward S. Rogers Department of Electrical and Computer Engineering has a strong interest in inter-disciplinary research, particularly in the biomedical field. More information can be found at www.ece.utoronto.ca. The successful applicant may have an opportunity to participate in the Centre for Cellular and Biomolecular Research, a new multi-disciplinary research facility.

The successful applicant will have a PhD, excellent teaching skills, a strong background in his or her discipline and demonstrated success at collaborative research at the interface between electrical engineering and medicine/dentistry. The individual will be expected to teach at the undergraduate and graduate level and initiate and maintain an independent research program, of international calibre, in one (or more) of Nano- and/or Micro-technology (including photonics, electromechanical systems), Systems Biology, or Neural Engineering (especially neural implants).

Applicants should send a curriculum vitae, a statement of teaching and research interests and at least three letters of reference to Professor Salwat G. Zaky, Chair, The Edward S. Rogers Department of Electrical and Computer Engineering, University of Toronto, 10 King’s College Road, Toronto, Ontario M5S 3G4, Canada. Search will continue until the position is filled.

Selection will be based on excellence in research and teaching. All qualified candidates are encouraged to apply; however, Canadian Citizens and permanent residents will be given priority. The University of Toronto is strongly committed to diversity within its community and especially welcomes applications from women, visible minority group members, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversification of ideas.

to this. However, it is not recommended that you go over a week. This can be helpful if you have multiple offers. A note about multiple offers... be careful when playing one against the other because it could backfire on you. While one offer can be a negotiating strength for you, you need to make sure both employers really want to hire you. You would not want them to rescind your offer and pursue another candidate. The employer you accept a position with should feel like you really wanted to come there.

So you have a couple of days to look over the offer. It recommended that you make a chart to analyze everything that is being offered. This is also helpful with multiple offers. You should rank the importance of each factor, such as flexibility-very important; salary-somewhat important, etc. You can also assign numerical ratings if that works better for you. Make sure you understand an organization’s salary and performance review process. If a future raise is promised as part of the offer, make sure that it does not contradict the company’s salary administration program. Ask yourself if the offer meets your financial obligations. Lastly, trust your “gut” or instinct. If a company, position, or offer doesn’t feel right to you, then it probably isn’t. However, your financial situation or urgency may override your decision not to accept the offer.

Regardless of whether you accept or decline the position, make sure you put it in writing! Lastly, make sure you never burn bridges. You could accept a position and get laid off in a month after hire. If the other company’s position is still vacant, you may want to contact them. Also, people move around to different places so you could have a valuable networking contact.

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Contributions
The Biomedical Engineering Society (BMES)
gratefully acknowledges the following contributors.

BMES Fund
Honors Circle
Hong Low
Peter Scherer
Networking
Lisa Waples, MS, Associate Chair
Co-op/Internship Coordinator
Dept of Biomedical Engineering, Marquette University

Throughout your biomedical engineering career, networking is a vital activity necessary for attaining your career goals. Successful networking occurs in many different ways and is important to pursue even when you are not seeking employment. For the undergraduate or graduate student, on-campus resources are plentiful for generating contacts in industry or academia that can lead to future employment. In particular, the career services office or internship/co-op office has information about potential employers in your chosen area. Most career service offices also host annual Career Fairs. These fairs provide excellent opportunities for the student to meet potential employers and learn about careers in industry, academia, and government. Students should make it a priority to attend career fairs to meet company representatives and collect contact information. Often companies will hold informational sessions in conjunction with on-campus interviewing activities. These sessions are typically held the evening prior to the day of interviewing and are open to all students, not just candidates with interview slots. The library and internet have extensive resources for identifying opportunities, (refer to the accompanying article by Jean Alley on Campus Resources).

Networking is not just tied to formal campus events. Fellow students are also good resources of information especially if they have completed summer internships or co-op employment and thus have industrial connections. Professional organizations such as local chapters of BMES provide opportunities for you to meet fellow students, faculty, and alumni. Get involved and build up your leadership and teamwork skills. Make sure to contact faculty for referrals to industry or alumni at your targeted companies. When you are actively seeking a position, let your family and friends know of your search. Many contacts come from personal referrals.

When approaching a company to gain employment, it is very important to have the name of someone within the company with hiring authority. Typically these people are directors or managers. If you have utilized all of the resources listed above, but still don’t have a target contact name within a specific company, then you need to place a “cold call” to the company. As a precursor to your phone call, review the company website. Ascertain if opportunities are posted on-line that match your qualifications. Most companies provide on-line submission of resumes for candidates and it is important to follow these traditional channels. Keep in mind that a successful job search always requires follow-up, which is difficult or impossible when your only contact is via the internet. When you submit your resume on-line it will usually be sent to the human resources department. Although human resources is integral to the identification and hiring of new talent, it is also very important to contact the hiring managers or directors in your target area, such as manufacturing, research, or quality. At this point, you must call the company to request the contact information. Make sure to know the company structure and size. Is the company small or are there multiple divisions? The smaller the company, the higher the level of contact you request. For larger companies, you will need to know the division in which you are interested in as many managerial and director positions may exist. Many times when calling cold you will not receive the contact information on your first attempt. There are many strategies to obtain contact information that have been detailed in “College Grad Job Hunter” by Brian D. Krueger, Adams Media Corporation, 1998.

After identifying a director or manager, send your resume and cover letter and then follow-up with a phone call within a week. At this point, be ready to discuss your interest in the company, your personal qualifications and specifically why you are an excellent match for the company. Be succinct, under a minute, and direct. Your goal is to get an in-person interview and not to garner a position at first attempt. If no positions are available, ask if there are others within the company that might be interested in your qualifications. Be certain to keep all contact information you generate and update it throughout your career. Remember, networking is a life-long activity.

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The search for a job is a daunting task, and most Biomedical Engineering or Bioengineering students feel that there are few if any helpful resources on campus. I want to spend some space letting you know that on even the least BME friendly campus there are numerous resources available to help get you started on your career search.

The first stopping point is your Career Center or Placement Office. The most obvious help that the Career Center has to offer are skills training workshops. These workshops in interviewing and resume writing are invaluable. Many placement offices also offer other workshops or one-on-one training sessions. You will need to check what is offered at your school. Career Centers also present career fairs. These are excellent networking opportunities even if the company to do so. Former students who have gone to school with them, taught them, been taught by them or they may have met them at professional meetings. The faculty members network with the industrial members on a regular basis. So, do not be afraid to ask for advice or contacts out in industry. The reputation of academic programs is partially based on placement of graduates; therefore, it is in the best interest of the faculty to help you find a position.

Departmental graduates from previous classes faced the same tough job market that you do, if not an even worse situation. My experience is that past graduates are ready to help in any way they can. Former students who have been out in the work force for 10-15 years have likely moved into positions where they can consider hiring or recommending you for specific jobs, while newer employees don’t yet have the standing in the company to do so. Getting the names and addresses of alumni can be tricky. Departmental faculty and secretaries should be your first stop.
Student organizations sometimes track alumni also. The Alumni Office of your school is likely to be less forthcoming because of privacy concerns. If your department has an internship coordinator, you can ask them for help. They have contacts with many companies and occasionally hear of job opportunities. They can also give you advice on how to seek out possibilities, since they do the same thing on a regular basis hunting for internships.

If your university is associated with a medical center, there is a goldmine available. Many company representatives who work with the doctors will appear on local biotech association lists. Also, doctors and other researchers within a specialty or who use specialized equipment may have corporate contacts that they will share with you.

Finally, do not forget your library. If you are fortunate, it will have subscriptions to books like the Medical Device Register and journals that have job listings. In addition, engineering and scientific conference proceedings are an excellent way to get contact names for industrial presenters. Look for industrial presenters in the abstracts of the proceedings. Check with your faculty for recent proceedings to review abstracts. The Medical Device Register and similar books help you find the names of companies in your field. In conjunction with a tool such as the online CareerSearch you have great resources for networking even further. Visit websites such as www.BMENet.org, www.mbb.umn.edu (Journals include: Medical Device & Diagnostic Industry, Medical Alley (note not a journal but a resource for MN/St. Paul). If your library does not have any of these, find out if you or your faculty members can request them. Many librarians are dealing with tight budgets, but will be helpful if they are convinced that a new journal will get sufficient use.

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BMES Proposed Code of Ethics
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Biomedical Engineering Research Obligations
Biomedical engineers involved in research shall:
1. Comply fully with legal, ethical, institutional, governmental, and other applicable research guidelines, respecting the rights of and exercising the responsibilities to human and animal subjects, colleagues, the scientific community and the general public.
2. Publish and/or present properly credited results of research accurately and clearly.

Biomedical Engineering Training Obligations
Biomedical engineers entrusted with the responsibilities of training others shall:
1. Honor the responsibility not only to train biomedical engineering students in proper professional conduct in performing research and publishing results, but also to model such conduct before them.
2. Keep training methods and content free from inappropriate influence of special interests.

Faculty Positions
MRI and Molecular Imaging
Department of Biomedical Engineering
Case Western Reserve University

The Department of Biomedical Engineering, Case Western Reserve University invites applications for multiple tenure-track positions at the assistant through full professor level. Candidates should have a research emphasis in MRI, image processing and analysis, molecular imaging, or targeted contrast agent development. We are interested in candidates who will expand in vivo, molecular imaging research. An existing, strong research and educational program in biomedical imaging is being bolstered by new molecular imaging research projects that include imaging biomarkers of cancer, assessment of therapy, and assessment of novel drug and gene therapy delivery systems. The candidate will join a group that includes many from the School of Medicine and that has many achievements including a Whitaker Development grant to hire faculty members and develop an educational program in this area, an NIH planning grant for an In Vivo Cellular and Molecular Imaging Center, and approximately $5.5 M in grants from Ohio and federal institutions to develop micro-MRI, micro-PET, OCT, and bioluminescent imaging facilities.

Candidates should have a Ph.D. and postdoctoral research experience. Qualified women and minority candidates are especially encouraged to apply. Send a statement of research and teaching interests, curriculum vitae, and the names, addresses, and phone numbers of at least three references.

Contact: Professor Patrick E. Crago, Ph.D., Department of Biomedical Engineering, Wickenden Building, Case Western Reserve University Cleveland, OH 44106-7207.
As the Internship Coordinator for Harrington Department of Bioengineering at Arizona State University, I get many questions from students regarding the job search process. Some of the questions that I am most frequently asked include, “How do I search for a job? Are there actually Biomedical companies out there and how do I find them? How do I know what I am worth?” Of course, each of these questions is incredibly important and the answers can determine the success or failure of a job search and future career path.

While bioengineering has not always been the most recognized field, that situation is rapidly changing. Companies today are finally starting to understand exactly what bioengineering is, and in particular, what bioengineers have to offer to their organization. Human resource departments and hiring managers are starting to identify the diversity that comes with the field of bioengineering and that a bioengineer may have more to offer than someone with a mechanical or electrical engineering degree.

A key part of the job search is realizing what unique skills you bring to the table. Regulatory experience is something any student should emphasize when they are job searching because most other engineering students will not have this experience and companies want engineers who understand the FDA process. It can even lead to other types of job opportunities. For example, one of our internship affiliates began recruiting students with undergraduate degrees for entry-level regulatory affairs positions after realizing that students had received FDA training while working on their senior design projects.

Bioengineers have another key marketable skill that sets them apart from other engineers; communication skills. Bioengineers are able to communicate not only with other engineers, but also with physicians and scientists, thanks to their extended understanding of biology, physiology, chemistry, electronics, and biomechanics. This is an important skill necessary for working in the interdisciplinary teams that are developing medical devices.

There are many ways to tackle a job search. Internships are a great way to get your foot in the door (and possibly even eliminate the need to job search at all), and will also provide you with skills and experience. Students at ASU are lucky enough to have a dedicated internship coordinator within the department, but even if you don’t have that type of program for Bioengineers at your university, there are other ways to go about finding companies.

As everyone knows, the internet has become a valuable job searching tool during the past decade. While many job search engines have not been a decent resource for job-seeking bioengineers in recent years, this is changing as the field becomes more well-known. Some of these search engines include www.zapconnect.com, www.medzilla.com, www.monster.com, www.BMEnet.org, and www.biospace.com (more biotechnology oriented). To enhance your search, try searching not just for “bioengineer” and “biomedical engineer” but use words such as “biomedical,” “biomechanics,” or “medical device.” These search engines will not only help you to find a job but will also give you a fairly good idea of the companies in your area. A Google search for “medical device” and “your state” can also be helpful. If you are still unsure of where to find companies in your area, try looking through the Medical Device Register (which can usually be found in your university library or bioengineering department) search the local chamber of commerce websites, or explore resources at your career services office.

The question of what you are worth can vary with your education, experience, the size of the organization, the amount of job responsibility you will hold, and the area of the country where you are applying. A salary survey and calculator can be found at www.devicelink.com to help you determine what you are worth. A 2003 survey from The National Association of Colleges and Employers found that candidates with a bachelor’s degree in Biomedical Engineering generally receive offers starting at $39,126.00 a year, while average offers start at $61,000.00 a year for a candidate with a master’s degree. These are general figures but can give you a good idea of the starting salary range.

If you keep these job searching tips in mind and market the special skills that you have as a Bioengineer, job searching should be much more productive.
In this issue, I will focus on some of the career paths that BME graduates can take. I would also like to thank those professionals who took the time to come speak to the students at the Annual BMES meeting last month. They shared their experiences and showed us there are many opportunities open for biomedical engineers.

When students are seeking jobs in industry, they often only focus on research and development positions, but jobs in manufacturing, quality, regulatory affairs, sales, marketing, and clinical support are also options for bioengineers. Two of the key strengths that I tell students to play up in their resumes are communication and FDA knowledge. These skills can go a long way towards obtaining a job in industry but are also attractive for government agencies that offer excellent opportunities.

Below you will find recruiting announcements for entry-level opportunities posted by the FDA and the Patent Office. These agencies actively recruit biomedical engineers and pay competitive salaries. They also provide a great place to start a career if you want to work in industry.

**Patent Office**
The U.S. Patent and Trademark Office (USPTO), located just outside the nation’s capital, is the government agency responsible for granting intellectual property rights for patents and trademarks. At the USPTO, we are dedicated to building a workforce as diverse as the ideas that drive the global economy.

If you have a degree in engineering or science, and want to balance your personal life with your professional needs, the USPTO has what you’re looking for! We offer an unparalleled benefits package. At the USPTO, we are dedicated to building a workforce as diverse as the ideas that drive the global economy. To apply for the Patent Examiner position, please go to [http://www.uspto.gov/web/offices/ac/ahrpa/ohr/jobs/exam.htm](http://www.uspto.gov/web/offices/ac/ahrpa/ohr/jobs/exam.htm) and complete the Patent Examiner Employment Application.

**FDA**

**Location:** Health and Human Services (HHS), Food and Drug Administration (FDA), Center for Devices and Radiological Health (CDRH), Rockville, MD and Washington, DC. CDRH is responsible for ensuring the safety and effectiveness of medical devices and eliminating unnecessary human exposure to man-made radiation from medical, occupational, and consumer products.

**Position Summary:** This position serves as scientific reviewer of data in a scientific specialty field to determine the safety and efficacy of medical devices. The duties primarily involve reviewing applications for new medical devices and making decisions based on the safety and efficacy of these devices.

**Salary and Rank:** Commensurate with education, accomplishments and experience.

**To Apply:** Send a cover letter and CV, including recent publications and statement of research and teaching interests, and the names and contact information of at least three professional references (preferably by email) postmarked by 2/28/05 to: Dr. John M. Tarbell, Chair of the Search Committee, PYN # FY-9755, Department of Biomedical Engineering, Room T-405, The City College, CUNY, 160 Convent Ave., NY, NY 10031.

Additional information available at [www.ccny.cuny.edu](http://www.ccny.cuny.edu)

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Duke University Assistant Professor Department of Mechanical Engineering and Materials Science Pratt School of Engineering

The Pratt School of Engineering at Duke University is currently undergoing a period of significant growth in human and physical resources driven by a highly successful Capital Campaign and a transforming endowment to name the Engineering school.

The Department of Mechanical Engineering and Materials Science, together with the Department of Biomedical Engineering, invites applications for tenure-track faculty positions at the Assistant Professor level. Applications are invited from candidates with research interests in one of two areas of research: (1) Biologically inspired materials – Candidates must have expertise in the synthesis, spectroscopic characterization, and processing of biologically inspired materials at the meso-to micro-scale, or modeling of their structure and properties by ab initio and/or molecular dynamics simulations; and (2) integrated bio-analytical devices including MEMS and microfluidics-based devices that combine soft wet biological components within hard dry microfabricated systems.

Successful candidates are expected to have an established research record, be capable of obtaining competitive external research funding, and to actively participate in teaching at both the undergraduate and graduate levels. A tenure-track appointment at the Assistant Professor level is anticipated, but appointments at the Associate or Full Professor level with tenure are available for exceptional applicants.

Applicants should submit a cover letter describing their research interests and qualifications, a curriculum vitae, and the names and addresses of three references. Please submit your application to materials@mems.duke.edu as a PDF (preferred) or Word file attached to your email.

Duke University is an Affirmative Action/Equal Opportunity Employer.

University of Wisconsin-Madison Department of Biomedical Engineering

The University of Wisconsin-Madison Department of Biomedical Engineering invites applications for tenured or tenure-track positions beginning July 2005. Salary and academic rank are commensurate with qualifications and experience. A Ph.D. degree in Biomedical Engineering or other related area is required. The successful candidate is expected to have exceptional potential to establish a strong research program in a biomedical engineering specialty, and must demonstrate outstanding teaching ability. Seeking faculty applicant with research interests in one of the following areas: cellular scale, micro/nano scale phenomena, or BioMEMs. Applications will be accepted until the position is filled, but for full consideration applications must be received by December 1, 2004. Send resume and names of three references to Prof. Robert Radwin, Chair; Biomedical Engr. Dept; UW-Madison; 1550 Engineering Dr; Madison, WI 53706-1609. Unless confidentiality is requested in writing, information regarding applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

UW-Madison is an equal opportunity employer functioning under an affirmative action plan. Women and minority candidates are specifically invited and encouraged to apply. Reference PVL 45942.