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A Word from the AMSRO President

Dr Craig Kutz

Dear AMSRO Members, both new and returning!

First off, I want to highlight that AMSRO would not be where it is today without the contribution and passion from such great lifelong learners. Our membership has grown exponentially in the past few years, making this year's current enrollment the highest in the 23-years AMSRO has been an organization. Truly, from all the Executive Officers, we thank every one of you! Your dedication to reaching for the stars and getting involved from ground-based simulations to bench research to outreach is incredible! I'm honored to call each and every one of you my friends and family in this journey!

AsMA as a whole has been focusing on the new generation of aerospace medicine enthusiasts. THIS IS ALL OF YOU. We are the future of the organization and the field – from civilian to military, student to resident, and even international to domestic. It truly is a great time to be involved in an exciting field.

I invite you all to explore a few of the exciting opportunities outlined in this edition of the AMSRO Orbiter. In addition, follow our website (amsro.org), or our facebook group (www.facebook.com/Aerospacemed) or Twitter (@RocketDocs) for more! Also, I highly encourage you to take a look at the new website and podcast from a few of our colleagues (explorationmedicine.com). If you have any additional ideas, questions or interesting experiences you wish to share, please do not hesitate to reach out to one of the Executive Officers!

Thank you for being a part of this amazing crew! See you in Dallas!

Keep looking at the skies!

Craig J. Kutz, MD, PhD
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Bellagio II

Dr Lisa Brown

Several AMSRO Students and Residents were offered the chance to attend the Bellagio II Summit in Moltrasio, Italy at the Grand Hotel Imperiale from September 5-8th 2017. The Theme of the Summit was "Space Medicine: Terrestrial Applications for Human Health Performance and Longevity." This was the second Summit, with the last occurring a decade ago. Organized by previous AsMA President, Dr Marian Sides and NASA Flight Surgeon, Dr Smith Johnston. I was fortunate to be able to attend this Summit.



Moltrasio, Italy



Grand Hotel Imperiale

The Summit was organized by all attendees split into separate working groups, each addressing a different aspect of Aerospace Medicine and its terrestrial application. Attendees were from several countries (including New Zealand!). Topics discussed included cardiovascular health, nutrition, sleep, genetics and many more. Each participant presented a summary of their literature search and following this, group brain storming sessions were undertaken to further advance the research in each field. The goal at the end of the Summit is to produce disseminated information to the public and Aerospace professionals about the different ways in which Aerospace Medicine has advanced



Grand Hotel Imperiale

terrestrial Medicine. The first of this output is the production of several panel discussions at AsMA 2018.

Specific highlights of the Summit included: a Skype session with Astronauts Dr Michael Barratt and Dr Ellen Baker about their experiences being both a Doctor and Astronaut and their personal thoughts on how Aerospace Medicine has advanced terrestrial Medicine; Summit dinner overlooking Lake Como; water skiing on Lake Como and meeting all the international attendees!

I would highly recommend becoming involved in future Bellagio Summits. It was truly a great experience both academically and socially and we have all learnt so much from this experience. Special thanks goes to Dr Marian Sides who organized the event and was so instrumental in ensuring that AMSRO members were involved.



AMSRO Attendees (Lisa Brown & Ilaria Cinelli)

Dr Lisa Brown
Senior Surgical Resident, General Surgery, New Zealand
PhD Candidate (Surgery), University of Auckland
Aerospace Medicine Research Fellow University of Oxford 2015

An insight into the Space Physiology and Health Masters Program, KCL

Elizabeth Young

I originally discovered the master's degree program in Space Physiology and Health at King's College London by chance, when I was looking for something to fill the time between my undergraduate education and medical school. It was a fusion of two of my lifelong interests, human health and spaceflight, that I previously had not thought possible to combine. In fact, when I began my bachelor's degree in biology, I'd assumed my interest in spaceflight would forever remain a hobby. I have now graduated after a whirlwind year, and my experiences while studying for my master's degree, rather than serving as a mere gap year, have ended up extensively informing my interests and career path as I prepare for my next steps.

The program at King's College, like most master's degrees in the United Kingdom, only lasts one calendar year, divided into three terms. As the cohort of students come from a variety of backgrounds, including medicine, biomedical engineering, physiotherapy, and biology, the first semester provided a general foundation in physiology, especially that of the muscular and cardiorespiratory systems. In the second semester, the focus turned to the application of physiology to spaceflight, and we learned the details of the reaction of the body to spaceflight from a selection of international experts. We also covered health concerns of aviation, such as acceleration and hypoxia.

In the final term, each student completed an independent research project and a dissertation writeup. These research projects are easily one of the greatest advantages to this program. Research opportunities are spread across the globe in an impressively wide variety of sub-disciplines of space physiology. I, for example, spent three months in Norfolk, Virginia, at Eastern Virginia Medical School investigating the neurological effects of cosmic radiation. Many of my coursemates went to mainland Europe, working in places such as the German Space Agency (DLR) in Cologne, Germany and universities in France and Austria. Their work investigated everything from microgravity-related bone loss in mice to developing algorithms for analogue spacesuits. Three months is a short time in which to complete a research project, but that summer gave us all valuable investigative and analytical experience and, perhaps more importantly, a personalized introduction to the field as researchers in our own right, not just as students.

Another beneficial feature of this program was its field trips. We spent a week visiting European Space Agency sites, including the European Space Research and Technology Centre (ESTEC) in Noordwijk, Netherlands, and the European Astronaut Centre (EAC) in Cologne, Germany. The visit to EAC in particular was not so much a student tour as it was a crash course in anything and everything related to the challenges and organization of human space exploration. We were introduced to the many career paths related to space exploration, including that of a flight surgeon, biomedical engineer, physiotherapist, and astronaut. One day we attempted the physical training regime used to rehabilitate astronauts after six months on the International Space Station, with embarrassingly poor results. Since EAC is on the same campus as DLR, we also had access to extensive research facilities used to study and develop human and robotic spaceflight. We were able to experience demonstrations or use equipment such as pressure chambers, a human centrifuge, and a tilt table, along with several experiments proposed for use on the International Space Station. Overall, the trip to EAC was a fantastic experience and a unique opportunity to see a functioning space agency at work, with all the science and management involved.

Of course, studying in this program was not without its challenges. As an American, moving to London was no small feat, but a fantastic opportunity to live in a foreign country nonetheless. It is also worth noting that the British education system is completely different than the American system, and it took me a while to adjust to the more independent style of learning. There is less day-to-day work assigned, but students are expected to do extra research and literature review on their own. They are then expected to integrate this extra work into exam answers and assignments. This is completely attainable, but as someone who was used to the more assignment-based American system, it did take some getting used to.

The benefits of this master's course are substantial. In addition to the physiology education, students also get a lengthy introduction to the space life sciences community and industry, especially that of Europe. The research

experience for the final project is particularly invaluable. The program is a great fit for anyone with a life sciences or health sciences background who is interested in human spaceflight, but hasn't had the opportunity to pursue this interest before. It is an excellent opportunity to get involved with current space medicine research and to build a career in the field. Since graduation, I have been collaborating on several related research projects, and hope to continue my involvement as I apply to and attend medical school.

Elizabeth Young

MSc Space Physiology and Health.

Elizabeth Young graduated with an MSc in Space Physiology and Health from King's College London in 2016 and will be beginning medical school at the University of Washington this fall.

NASA's JSC Aerospace Medicine Clerkship Experience

Dr Brent Monseur

Even the most observant physician may have missed it. There, behind a glass wall, the human quintet exhibited piloerection, an involuntary erection, of discrete bundles of keratin filaments as well as topographical changes in their outermost layers. South of the border, this physiologic phenomenon is known as "la piel de la gallina" due to its resemblance to poultry skin after plucking. In medical jargon, the appearance is known as *cutis anserina* or *horripilation*. Down in Texas, they are known as "goosebumps." Mounted above a room full of monitors and scientists, an interactive map indicated that the International Space Station (ISS) was hovering above South Africa. I had just entered Mission Control at NASA's Johnson Space Center (JSC), colloquially known as "Houston."

Third year rotations across the country include a wide array of experiences; however, many specialties are not a standard part of curricula. During fourth year, students are often encouraged to explore new areas of medicine prior to starting residency. I relished at the opportunity to find an experience outside the traditional walls of a classroom, laboratory, or hospital.

Having previously trained as a reproductive biologist, my interests naturally gravitated towards a career in obstetrics & gynecology (OB/GYN). As I interacted with my patients on the wards, I witnessed the direct effects on family planning due to increasing numbers of women entering the workplace and delaying childbearing. Addressing these challenges relied on primary prevention (designed to stop a disease or illness from happening in the first place [ex., vaccine for flu, regular exercise for cardiovascular disease, or contraception for pregnancy]), the development of innovative technologies, and the use of alternative health care delivery strategies. I began to draw parallels with a specialized cadre of practitioners, flight surgeons, and the obstacles facing a unique group of patients: astronauts. I realized that the very same tactics that attracted me to OB/GYN form the bedrock of a completely different specialty—aerospace medicine. Specifically, I envisioned investigating issues of spaceflight contraception and delayed childbearing due to career goals and cosmic radiation, issues where aerospace medicine and gynecology intersect.

As the space program sets its sights on faraway destinations, engineers will have the difficult task of solving problems associated with interplanetary expeditions. Greater still may be the psychological and physiologic challenges that even the most intrepid explorer has ever faced. Given these risks, each astronaut is assigned a personal physician and psychiatrist in addition to the team of biomedical engineers who monitor safety from the ground. I wanted to learn more about this cadre of practitioners comprising a highly specialized niche of occupational medicine.

As my classmates reviewed lecture notes for dermatology, anesthesia, or ophthalmology electives, I commenced a 21-hour road trip into uncharted territory. Sitting in Building 110, I fidgeted with the two forms of government-issued identification I had been instructed to bring. As I waited for security clearance, I imagined what was hidden inside the massive warehouse structure across the street. After receiving the necessary badges to officially enter the campus of the Johnson Space Center, I decided to explore a bit before reporting to orientation at 0730 hours. She was about as long as the Statue of Liberty lying on her side. The warehouse, "Rocket Park," was

once the site of an open-air totem to space travel and now serves as an enclosed shrine to the impressive Saturn V ("Five") rocket developed for Apollo missions to the Moon.

Five was also the number of chairs arranged around a circular conference table at the orientation site in Building 37. There I would also find my workstation for the next 4-weeks adjacent to the former sleeping and rehabilitation quarters of the Mercury 7, America's first group of astronauts. As our coordinator began, the onslaught of acronyms overwhelmed my senses as if I was drowning in a bowl of alphabet soup. Nothing in my training had prepared me for discussions on orbital mechanics, aerospace engineering, or cosmic radiation. This feeling would continue during a series of lectures by laboratory scientists, flight surgeons, and astronauts. Experts in each of their respective fields reviewed the basics of space physiology and the medical aspects of ISS operations. While the speaker mentioned anthropometric measurements, microgravity induced bone loss, or reactivation of latent viruses, I found often myself daydreaming in an attempt to even conceptualize this group of patients' home in low-Earth orbit. Floating 250 miles above the planet Earth is a 450-ton habitable satellite housing astronauts and multiple research laboratories that spans the size of an American football field. And in the time that you read this last sentence, the Station has traveled over 75 miles (that's a velocity of 5 miles per second!). As the content of these lectures seemed more and more like the setting of a grand space opera I was still just trying to convince myself that I was actually at NASA. I had commended myself on being adaptable, switching teams and changing services multiple times during third-year rotations. And yet, unlike in the hospital, I found it difficult to adapt to what seemed like a sci-fi fantasy. Each day felt more surreal than the last.

Perched on one side of Building 9 is a catwalk providing an aerial view of space-vehicle mock-ups from the ISS to the Orion capsule designed for a manned mission to Mars. Across the room is an area teeming with futuristic robots resembling centaurs, arachnids, and what appears to be a Cylon straight out of Battlestar Galactica. As a clerk, I was permitted on the ground floor. The crowded catwalk disappeared from my view as I entered the Japanese module of the Station, Kibo. I closed my eyes and imagined the hiss of the cabin pressurizing as we entered the thermosphere. Inside the third brightest object in the night sky, we made the 90-minute orbital free-fall around our home planet.

Later, I found myself in the cockpit of the historic shuttle spacecraft before ultimately sitting in a T-38 supersonic (the Talon) jet simulator, just one of the aircrafts that comprises NASA's full fleet at Ellington Field. Admittedly, I could have used some scopolamine for the motion sickness. We drove 20 minutes offsite to a secure location housing the United State's largest swimming pool: the Neutral Buoyancy Laboratory. As you can imagine, having 6.2 million gallons right next to the Mission Control Center would not be the best move. I forgot my trunks, but I think the diving team wouldn't have wanted me to disturb the local aquatic life: astronauts training for space walks.

Hidden behind a 19,000-pound double locked vault with a 150-pound watertight seal is a collection of rocks...from the Moon! In what could be a scene from a movie, we donned white bunny suits before stepping into an air lock to rid ourselves of debris before entering the elusive Lunar Lab. Dating back over 4-billion years, we received a guided tour from a geologist on how the ancient rocks were cut with a retrofitted, diamond impregnated meat saw.

As my clerkship came to an end, I pulled over to Rocket Park for one last moment with the Saturn V rocket. There in its awe-inspiring presence, I looked to the sky and imagined the 6-month deep space voyage to the Red Planet. The semi-annual four-week aerospace medicine clerkship is offered in April & October. Details about eligibility, application, and selection process can be found [here](#).

[Originally published as part of AAMC's series on [Aspiring Doc Diaries](#)]

Dr Brent Monseur, MD ScM

OBGYN Resident Physician & Reproductive Biologist

Brent is an OB/GYN resident physician at Thomas Jefferson University Hospital in Philadelphia, PA. Prior to his clinical training, Brent worked as a reproductive biologist at the Johns Hopkins Bloomberg School of Public Health (JHSPH) studying fertilization in the laboratory setting. During his graduate studies, he completed interdisciplinary coursework focused in public health and molecular biology. Brent received his MD at the Medical College of Virginia (VCUSOM). His academic interests are focused in the unique health disparities that members of the LGBT community face when planning their families. Brent also has an interest in the future of reproductive medicine within the context of interplanetary travel specifically including spaceflight contraception management and the effects of cosmic radiation exposure.

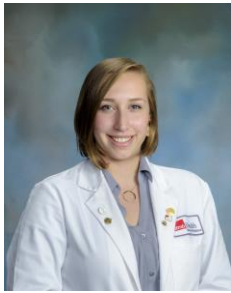
Meet the AMSRO Officers

President

Craig Kutz

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Craig has completed an MD/PhD from the Medical University of South Carolina in Charleston, SC. He has been an AMSRO officer for 5-years and an avid civil aviation pilot for the past few years. He is also a scientific diver for his local aquarium, diving with the sea turtles, sharks, and other coastal South Carolina fauna.



Vice President

Kseniya Masterova

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Kseniya is a first year M.D./Ph.D. student at the University of Texas Medical Branch. She graduated from Loyola University Chicago with a degree in physics and biology. She has spent the last year working as a research assistant in the Space Medicine Innovations Lab at Giesel School of Medicine at Dartmouth. She interned at NASA Johnson Space Center during summer of 2015 with the Lifetime Surveillance of Astronaut Health.

Secretary

Emily Stratton

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Hailing from the beautiful state of Washington, Emily currently lives in Syracuse, New York where she is an emergency medicine resident physician at the State University of New York Upstate Medical University. She is very interested in the field of aerospace medicine and was the recipient of the 2016 Gregory G. Shaskan, MD Aerospace Medicine Education Scholarship and is active in aerospace medicine research and podcasts. In her spare time, Emily enjoys staying active, traveling, trying out new foods, writing/reading, and spending time with her animals. Emily has her SCUBA open water certification and hopes to get her pilot license sometime in the next few years.



Treasurer

Stefan A. McAllister

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Stefan A. McAllister completed a B.S. degree in psychology and an M.S. degree in biology with a concentration in molecular genetics and biochemistry at Georgia State University, along with an M.S.P.H. degree (honors) at Meharry Medical College. After graduation, he interned at the NASA Ames Research Center in the Psychophysiological Research Laboratory and the Vision Science and Technology Group. He was an active member of every AMSRO committee and has served as the chair/co-chair of the AMSRO Scientific Paper Award Committee from 2014 through 2017. Also, he served as co-chair of an AsMA Scientific Meeting Session and deputy chair of the AsMA Committee on Career Development. Currently, he is a member of the National Stuttering Association Research Committee.

Parliamentarian Chris Haas amsro.parliamentarian@gmail.com

Chris has completed internal medicine residency at Baylor College of Medicine (BCM) in Houston, TX. He is now in his first year of the UTMB/Aero Med program. Chris started off his studies as an undergraduate in aerospace engineering with research in the space life sciences field (in microbial growth and resistance to antibiotics in weightless environments). He worked in the satellite command and control industry prior to transitioning to medical school in 2010. He is a graduate of the NASA Johnson Space Center Aerospace Medicine Clerkship (Fall 2013). He currently does genomics research with the Center for Space Medicine at BCM. He hopes to continue his work and research in aerospace medicine upon completing residency training.



Editor Lisa Brown amsro.orbiter@gmail.com

Lisa is a 4th year General Surgery Resident in New Zealand and also in the final stages of her PhD in Surgery. She has completed the UTMB Aerospace Medicine Short Course and was The University of Oxford Aerospace Medicine Research Fellow in 2015. Lisa is an avid ocean swimmer and loves being out in the snow both home in New Zealand and abroad. Her research interests are around surgical treatments in microgravity. Lisa is keen to promote an international interest within AMSRO.

Webmaster Andrew Mergl amsro.webmaster@gmail.com

Andrew is a first-year internal medicine resident at NewYork-Presbyterian Queens, NY after an MD/MPH at St. George's University. He received an undergraduate degree in physics from McMaster University in Canada. He always had a special interest in astronomy and space and has contributed to the LIGO gravitational wave detection project during a summer work placement. He hopes to continue his training and involvement in aerospace medicine after completing residency. Other interests include reading, scuba diving, camping, and skiing.



KEEP IN TOUCH WITH AMSRO!

Facebook: <https://www.facebook.com/Aerospacemed>
Twitter: @RocketDocs
Website: www.amsro.org

Upcoming events / notices

AsMA 2018!

May 6-10th, Hilton Anatole Hotel, Dallas, TX

There will be AMSRO events throughout the Meeting which everyone can get involved with.

The Secretary has sent out information regarding room sharing.

Information is on the AsMA website about the meeting
www.asma.org



AMSRO Annual Membership Renewal

Don't forget to keep your AMSRO membership up to date! Contact Stefan McAllister if any queries.

Orbiter Articles

Please send your articles to me (Lisa) for publication in the next Orbiter!