

The Staff

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## From the Editor

When doing a newsletter was first proposed, it was thought to be in addendum to other responsibilities. As a graduate student who signed on to 2001: A Space Research Odyssey, I expected to do most of my work in the laboratory modules, mediating relationships between scientists who were probably ultra-focused on their research, NYC teachers, who were to create comprehensive, cohesive, and attractive material from the amorphous gelatin of newly conducted scientific research, and NYC high school students, who if all rumors are correct, are some of the least tame creatures to roam man's natural habitat.

The project quickly unfolded into the challenging task of finding, organizing and presenting material that would interest readers and inform them of the curricular progress being made. Was progress made? Like it seems in all things science, from an opaque haze of unexplored enquiry materialized a form, if basic at first, of substantive nature. The lesson plans extracted from *Playing With the Pros* actually looked like they might work.

Content arrived daily. Numerous visits were made to laboratories, during which large things spun in tight control, gases were shot through machines to analyze content, and grown-ups tinkered with million-dollar toys. Frequent entertainment was provided by the antics of some of the students; and even the teachers, austere and commanding, gave us some hearty chuckles from time to time. (There were those who, perhaps, should have pursued careers in front of a different kind of audience)

The experience was stressful and taxing, exciting and enlightening. Daniela DiBiase and Ben Blattberg provided excellent service; the writing and photography both allowed the newsletter to fully represent the goings-on at this productive, albeit hectic, five week event. In the end of the first phase of Defying Gravity, we can look back at this publishing effort with pride and much anticipation of what the next three years will bring.

## Ear, Nose & Throat; Central to the NSBRI Mission



Digital video of an endoscopy, similar to the procedure performed on a DG participant.

The field of otolaryngology, the technical term for study of ears, nose and throat, has had a long history of collaboration with aviation and space medicine. Relative to other biomedical fields, not much is known about the physiology and structure of the nose and paranasal sinuses in microgravity. In fact, even in normal gravity, this field remains to be fully explored. Such is the reason why the NSBRI's research into Rhinology and Otolaryngology in particular is important

not only for astronauts, but for earthbound biomedicine as well.

The effects of poor rhinologic health are widespread. Upper respiratory tract infections are one of the major complaints of U.S. Air Force aviators. Poor sleep caused by disruption of the breathing cycle, snoring and other maladies can have severe effects on the physical performance and psychological well being of astronauts.

Patrick Gannon, PhD, co-director with William Lawson, MD, of the Rhinology Research Laboratory at the Mount Sinai School of Medicine and director of the Defying Gravity program studies the nose and associated structures in detail. Similar to Dr. Bobby Alford, Chairman of the Board and CEO of the NSBRI, Drs. Gannon and Lawson believe rhinology studies in microgravity will offer benefits to space travelers as well as medical patients on earth.

The ENT Department at MSSM is particularly well-suited for the task of studying the effects of microgravity on the nose and paranasal sinuses. The Rhinology

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## Dennis Bassin and Students Study Psychosocial Stress

Imagine yourself in the confined quarters of a space vessel. There are no pleasant hues painted on the walls, no ocean scenes hanging above the bed. In fact, there is nothing resembling a bed in sight. The habitat is entirely utilitarian; instruments and equipment comprise the environment. Combine this with terrible food, physical disorientation, numerous challenges to health and a very, very long flight sharing a small space with several other people and you have the ingredients for a type of work-related stress rarely found on earth.

Psychosocial stress is a major obstacle to be confronted in the planning of a trip to Mars. Roundtrip, the journey may take up to three years, and despite the vastness of space, none of it is hospitable to a veranda: there is no escaping the confinement of the vessel. If Jean-Paul Sartre was correct



Dennis Bassin and SauLing Chan

when he said Hell is other people, future astronauts may bargain for more than they can handle.

The intangibility of stress and pressure can take its toll in the physical world: a nearly fatal docking error on the Russian space station Mir was caused by stress and fatigue of the Russian astronaut occupying the vessel. Clearly, a well-rested, relaxed crew is capable of completing tasks with more accuracy and efficiency than a crew

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Inside:  
Psychosocial Stress module,  
Drs. Pat McArdle and Morton  
Slater, Focus on ENT research  
team, and exit opinions.

The Defying Gravity Educational Outreach Program is funded by the National Space Biomedical Research Institute (NSBRI #00-02-013).

## ENT & NSBRI: A Long Collaboration of Research

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lab calls on the expertise of both sinus surgeons and broad-based research scientists to examine functions and diseases of the nasal structures. The continued study of nasal physiology in particular, is considered a priority and an exciting new direction awash with undiscovered information.

In order to understand the reactions of the upper respiratory tract in microgravity, an extended series of studies will be done on patients in earth's gravitational field. Cutting edge imaging technology and the resources of MSSM's research laboratories will be utilized to compile data. This information will then be used to model situations in microgravity.

To better understand changes in upper respiratory tract functions in space, the Rhinology Research Laboratory and Dr. Eric Genden, ENT surgeon, will utilize the head-down tilt normal gravity model of simulated microgravity. Simulated microgravity conditions will be compared to healthy individuals in normal gravity (erect body position). Non-invasive monitoring via use of a routine micro-endoscopic analysis and multiple physiologic variables such as mucosal bloodflow, nasal resistance, airflow and nasal cycle measured using an acoustic rhinometer will provide data. Olfactory function, the sense of smell, will be a major focus of this research effort.

The Rhinology curriculum module consists of two parts. First, a digital video of a live endoscopy of the upper respiratory tract has been used to assess an individual's reactions to simulated microgravity. This state is achieved by placing an experiment subject in the head-down tilt position. The video is projected onto a large screen so all participants can see the inside of the nasal and pharyngeal structures. The second part of the lab is a digital video review of techniques used to relieve nasal airway obstructions. Dr. Genden has been working with a new, minimally invasive technique called somnoplasty that corrects habitual or obstructive snoring that can pose particular problems in the confined habitat of a space travel vessel.

For participants of Defying Gravity, after viewing the digital videos, a discussion

was held concerning the effects of sleeplessness and fatigue on human performance both in space and on earth. Methods of assessment and treatment were also discussed. The subject of providing countermeasures for long-term/distance spaced



Leal, a MSSM medical student, works with Nelson Shih to study microgravity.

travel-related rhinologic disorders has been essential in bringing conceptual understanding and critical thinking into the curricula of Defying Gravity students and teachers.

ENT has long been a collaborator with the NSBRI. The importance of the research and development of understanding nasal structures and providing solutions to problems encountered in space and on earth will be crucial to the planning of a trip to Mars as well as providing curriculum content for high school students nationwide.

## Dennis Bassin and Psychosocial Stress

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The alpha testing stage of the psychosocial stress module

that is stressed. For such a long journey as the one to Mars, the mental condition of the crew is essential for the venture forth, and the safe trip home as well.

So what measures are being taken to counteract space travel psychosocial stress? And more acutely for the Defying Gravity program, how can this research attract high school students to the wonders of science? Dr. David Brook, Professor of Psychiatry, utilizes Personality and Learning theories to study the effects of such stress on the physical and mental health of astronauts. Techniques used to evaluate candidates for space travel include: rating and modifying behavior, monitoring stressful behavior and observing gestures as signs of stress. NASA

## A Retrospective Opinion

by Nelson Shih

As the economy and our standard of living become ever more reliant on the development of science and technology, the way we interest the future researchers of our society should evolve with the times. Our school systems today, although improved from past decades, still encourage the meaningless cycle of book learning. The younger generation is trapped in the repetitive process of reading and memorizing what other scientists have already discovered and applied. Undoubtedly, it is necessary for students to understand the theories and basic principles of science and technology. However, in order to capture the interest and passion from teenagers like myself, it is consequential that we motivate them with what is new and upcoming.

Defying Gravity: Enduring Life in Space, is a program that allows students to apply their knowledge and creativity towards scientific progress. In many ways, we are the core of future space exploration. By the time that NASA starts sending astronauts to Mars and the edge of the solar system, we will be those astronauts. I think that DG has created a wonderful way of converting students into researchers. We have been given an opportunity to develop the theories and experiments that future students will study.

is currently funding an on-board study of psychosocial stress among astronauts.

According to Dr. Brooke, in the near future, the methods of selecting astronauts will change. With environments on earth such as the outpost in Antarctica (where a health crisis was recently confronted when a doctor diagnosed herself with breast cancer and successfully fought it in the isolated region) and submarines, which pose similar challenges to humans, the effects of confinement for long periods of time are currently being studied. The major difference is that in space, no one comes to the rescue in a crisis.

Educator Dennis Bassin has been working with students Theresa Zhou and Clarke Gradinger to devise a module that will interest students in psychosocial stress utilizing procedures that would elicit stress in space. Eight nuts are drilled into a board. Wearing cumbersome gloves, students must work blindly to screw six ran-

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**NEW EDITIONS COMING ON  
A MONTHLY BASIS. STAY  
TUNED FOR  
FURTHER RESEARCH  
UPDATES.**

## Dr. Morton Slater, of the Gateway Institute

Interviewing Dr. Morton Slater, director of the Gateway Schools and education expert, was no easy task. Between making coffee, checking his email, answering his three phones and driving to a meeting, Slater managed to share some tidbits of knowledge that he's acquired over his long career in the New York City Public School system. Like Dr. Slater's driving, his comments were direct and confident.

First off, Slater revealed his ideas on what makes a curriculum successful. The most important point to consider when developing a curriculum is to design tools that would help teachers such as test questions, classroom activities and detailed lesson plans that are flexible enough so a teacher can expand and adapt the material to suit the needs of their students. In addition, if a curriculum is to be successful, teachers must be well versed in the material. "How you train teachers and the teachers' willingness to be trained will depend on the value of the curriculum itself," said Slater. Another way to develop a successful cur-

riculum is to take an approach like Defying Gravity is doing -open a new world for teachers by introducing them to entirely new information. Slater notes that if this approach is taken, the curriculum developers have a responsibility to work with the school's principal and determine where the material can fit into the current curriculum.

When asked his opinion of the "hands on" approach to teaching in the classroom, Slater said "hands on is good when it's part of a general course where kids learn information-when there's integration of hands-on learning with factual information..." Science requires reading, research, and analyzing new information, Slater said. If a student has not done any hands-on work in the classroom, he or she will not have the skills needed to do laboratory research.

Slater placed particular emphasis on the importance of principals in developing successful education methods: "The principal is the curriculum and instructional leader. They groom teachers and can make the average teacher into a very good teacher." NYC loses good educators to the suburbs and many experienced teachers are

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## Dr. Patricia McArdle, Associate Dean at MSSM

Dr. Patricia McArdle is the associate dean for curriculum support and medical education research at Mount Sinai School of Medicine. Before coming to Mount Sinai a little less than two years ago, McArdle was a dean at Harvard University for over twenty years. She began her career as a high school teacher. Dr. McArdle feels that the Defying Gravity program is a unique opportunity in a developmental approach to science education because it's reversing the normal trend in curriculum development. Defying Gravity begins with cutting edge technology and current research and then works backwards to develop a curriculum for high school students. "Jumping from graduate school stuff to high school is really exciting," said McArdle.

"The second thing that intrigues me about [Defying Gravity], is that there is a strong motivational component, so not only are you trying to convey information at a level where students can understand it, but Defying Gravity also considers how to get people excited about space," said McArdle. This is one area where students who are helping to develop the curriculum



have an important role. They have grown-up reading and hearing about space exploration and they know what interests them and their peers. "It's wonderful to have them as part of the team," said McArdle.

One consideration that must be taken into account when developing a new curriculum is that you have to carefully think through what you're going to teach and how you can take this idea and expand it for students who are interested in going farther, McArdle said. At the Defying Gravity summer institute, teachers are helping to create a package that they think will work in the classroom as opposed to testing a product developed by someone else. At the summer institute scientists, teachers and students are developing a product that will be tested by themselves and their peers.

One of the challenges that this project faces is that it has to meet external standards such as Regents exams in New York



## Dennis Bassin on DG's Curriculum Development

The Defying Gravity Program this summer invokes two distinct mental images. For those old enough to remember, the first was a musical production on Broadway. Younger people may have rented the videotape of the motion picture. I am speaking of the show entitled, "1776." I am, of course, old Dr. Benjamin Franklin, since every enterprise of this nature requires an Old Character. The founders of the United States of America faced the same problem of "creating on a blank sheet of paper." I leave it to the reader to determine who represents John Adams and Thomas Jefferson in our group, but the animated interactions and discussions have been with us since July 2.

Curiously enough, our activities over the past five weeks have evoked a second mental image. As pointed out so aptly by Ms. Chan, our work area was actually quite limited. In addition, we faced the pressure of creating a "product" by August 3. This certainly sounds comparable to a five week space mission! One does not have to concentrate deeply to bring forth memories of key events and interactions between individuals that constituted PSYCHOSOCIAL STRESS. With a better appreciation for the angst generated by the birthing of our nation, we should all be proud of the fact that something very worthwhile was done on the 13th floor of the Annenberg Building during five weeks in the Summer of 2001. Arthur C. Clarke et al (You remember al, don't you?) would be tickled plum to death.

State and national educational standards. This means that the Defying Gravity participants needed to keep these standards in mind when developing the curriculum. The Defying Gravity Program will be tested over a three-year period. By the end of third year it should be evident what will

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Q & A with students during the last week. Their perspectives on curriculum are immeasurably valuable.



In the final days of the summer institute, students shared ideas, and the mike, about modules.



During the final week, presentation given by each team were video taped and recorded on audio cassette for future data retrieval. Here, Nelson Shih talks about taste and smell perception in space.

## Studying Psychosocial Stress

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domly selected bolts over the nuts. The catch is, much like a toy for tots, each nut is a different size and must be fitted with the matching bolt. Though this hardly resembles a true space crisis, the experiment does place students in a stressful situation loosely modeled on a very real space-flight situation: equipment repair.

Teams of students will compete for the best time. The goal of the module is to create a discussion on the nature and effects of psychosocial stress using space as the hook. Results will be used to educate students about psychosocial stress here on earth, a common problem.

## Morton Slater Tells It Like It Is

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retiring, so there are more inexperienced teachers in our classrooms.

Dr. Slater also pointed out the important role played by parents. Parental involvement is very important in education. They need to know what is expected of their children. Teachers must communicate with parents on a regular basis and this even means calling them on the phone. Parents can be notified whether the student is keeping up with the work. Parents also need to know early on about college and financial aid. Slater suggested their schools should run seminars for parents to keep them informed.

Slater has tried to tackle some of the issues in NYC public schools at Gateway. "Gateway's secret to success is that it empowers teachers," said Slater. There is continuity between all four years of the curriculum. The science program was thought out with a continuing plan about what skills and information students need to develop. Gateway schools have a development coordinator or a lead teacher who runs the program budget, makes decisions and puts resources directly into the hands of teachers. Another reason why Gateway has been so successful is because of its many outside resources. Gateway works with institutions like Mount Sinai School of Medicine, Rockefeller University, Roswell Parks and Jackson Labs. Students who perform well in school have access to all of these facilities. "Our philosophy is if you want to be here [in a Gateway school], we're gonna tell what you need to do to get to where you want to go."

Dr. Slater finished his remarks by stating how he looks forward to collaborating with the Defying Gravity program in the beta-testing phase in the near future.

## Sarah Walters on Final Week Presentations

So that's what everyone has been doing for the past three weeks. I was delighted to have the chance to hear the presentations this week. I found all of the presentations very interesting. I always like it when I get the chance to learn about something new and interesting. I am glad that I had the opportunity to learn more about the different ways people are affected in space. It's weird knowing that I have seen the curriculum that could be taught over the course of a year, in two days. No wonder I am tired; but it is a good tired.

## Interview With Pat McArdle

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work for different students. "By that time you should have a greater sense of your audience." In order to evaluate the success of the curriculum, educators must ask themselves and their students a short set of questions: Did they enjoy it, did they learn anything, would they do it again, what was the effect and how much did it cost?

Defining Gravity is still in the early stages of curriculum development. The participants have devised their own modules which will be beta-tested in NYC high schools this fall. The next step in the curriculum phase is to develop ways to help teachers use the curriculum in the classroom such as examination tools, said McArdle. Curricula have their own life cycle, McArdle said. It takes time to develop them and they must be revised along the way. DG has just completed the first step in curriculum development, and is on its way to completing a successful voyage.

## Valentina Lugo, Final Thoughts

After three long weeks of research, consulting with scientists and creating PowerPoint presentations, all six teams had the opportunity to share their work during this final week. On Monday and Tuesday, we sat through many lectures and PowerPoint presentations created by students and teachers. It was pleasing to witness the final products. Wednesday and Thursday included activities and demonstrations created for the classroom. I enjoyed carrying them out because we were able to experience the creativity of each of the teams. The only scary thing resulting from this week is that the end is near; school is almost here. Nevertheless, everyone should be proud of his or her accomplishments because this job was not easy. After this week, I am confident that the students of the beta-testing schools will learn a great deal, as well as have a blast. Congratulations everyone; you have officially defied gravity.

### Defying Gravity Teams

- 1: **Neurovestibular Adaptation & Radiation Effects.**  
Ray Rappaport, PhD, Valentina Lugo, Swetha Peteru
- 2: **Bone & Telemedicine**  
Tobie Brandriss, Sarah Walter, Adelina Hung
- 3: **Astromedicine & Psychosocial Stress**  
Dennis Bassin, Clarke Gradinger, Theresa Zhou
- 4: **Fourier Analysis & Waves**  
Neil Farley, Rivkah Darabaner
- 5: **Powers of Ten & Sleep & Neurocognition**  
Roopali Singh, Matthew Dusenberry
- 6: **Olfaction & Taste & Breathing in Microgravity**  
SauLing Chan, Nelson Shih, Shanewas Uddin