Have Spacesuit Will Travel

2012 Program Summary

Ninth grade student at South River High School in Edgewater, Maryland, tries on the Sokol spacesuit after reading *Have Spacesuit Will Travel* this past summer.

Prepared by Don Thomas

February 1, 2013

Executive Summary

The *Have Spacesuit Will Travel* Program was continued in conjunction with Dr. Don Thomas and Towson University during 2012. A total of 252 students from three area schools participated by reading Heinlein's book and completing a space-themed project. This brings the total number of students participating in the full HSWT program between 2009-2012 to 978 students.

The footprint of the *HSWT* program was significantly expanded during 2012 to include classroom visits and presentations at 11 additional schools within Maryland as well as at schools in Philadelphia and Atlanta. These presentations and programs involved over 2,800 students and family members. Of special note was the participation of a Baltimore inner city high school as well as an all-female private school, both of which are working to encourage their students to pursue future careers in science, technology, engineering, and mathematics.

***HSWT* also participated in a visit to some very sick children at the Johns Hopkins University Hospital as part of the *Believe in Tomorrow* program, attempting to make a sick child's dream come true for a day.**

Have Spacesuit Will Travel

2012 Program Summary

During 2012 the Heinlein Prize Trust together with Dr. Don Thomas at Towson University presented the ***Have Spacesuit Will Travel*** program at two different public schools and one private school in Maryland. These schools included:

St. Casimir Catholic School (private school, Baltimore City)
1035 South Kenwood Ave.
Baltimore, Maryland 21224

North County High School (Anne Arundel County Public Schools)
10 1st Avenue E.
Glen Burnie, Maryland 21061

South River High School (Anne Arundel County Public Schools)
201 Central Avenue E.
Edgewater, Maryland 21037

North County High School and South River High School participated in the ***HSWT*** program previously in 2009, 2010, and 2011, and continue to be strong advocates for the program. Both of these schools are STEM (Science, Technology, Engineering, and Mathematics) magnet schools with rigorous science and math programs and curriculum designed to attract the best students into STEM and to prepare them for college entry and technical careers in the future.

In 2012 the ***Have Spacesuit Will Travel*** program was expanded to a new school, St. Casimir Catholic School, located in Baltimore City, Maryland. This was done in cooperation with the Enoch Pratt Free Library.

A total of 252 students participated in the program from these three schools in 2012, reading Robert Heinlein's book ***Have Spacesuit Will Travel*** and completing various technology development and art projects as part of the program. With the previous 686 students that participated in **HSWT** between 2009- 2011, the total student participation in ***Have Spacesuit Will Travel*** has grown to 938 students.

Since its inaugural year in 2009, **HSWT** has been such a big hit at North County and South River High Schools that both schools are already anxious for us to repeat the program for them with their incoming freshman class in the fall 2013. To illustrate the impact that **HSWT** has had, South River High School has made it one of their signature programs that they use to promote their STEM program and recruit incoming freshmen to their STEM magnet school. Since the **HSWT** program was started with these two schools in 2009, every STEM student at these schools has participated in the program. Multiple times this past year I had some of the older students from previous years come up to me to say how much they enjoyed **HSWT**. Their teachers all tell me it is truly one of the highlights of their STEM program and one they are extremely proud and excited about.

A wall-sized display of their signature STEM programs at South River High School prominently features *Have Spacesuit Will Travel* as one of their project based learning activities.

HSWT at Casimir Catholic School Baltimore, MD

In 2012 a new collaboration was initiated with the Enoch Pratt public library located in Baltimore, Maryland. The library had been working closely with a few elementary, middle, and high schools in their area, and they thought the **HSWT** program would be an ideal project to involve one of the schools. The school chosen was the St. Casimir Catholic School located less than a half mile from the library.

In January I met with library officials and one of the teachers from St. Casimir to discuss the program and establish the schedule. It was decided to target the 6th and 7th grade students at the school (32 in total). The Enoch Pratt Public Library went ahead and purchased copies of **HSWT** for the students which was made possible from local agency grant. As most of the students were from low-income households it was decided to allow the students to keep the books instead of loaning them and collecting them back later.

The 32 participating students were given the books in late February and on March 27 I met with the students to discuss spacesuit technology, the purpose of spacesuits, and the different types of spacesuits that are used. During this visit we also allowed 5 of the students to try on the Sokol spacesuit which the entire group enjoyed witnessing. At this point the students started working on their projects involving improved and futuristic spacesuit designs.

On May 1 I returned with the Sokol spacesuit to review the projects they had been working on. Tables were set up in a big lecture room at the library and students displayed their projects and posters for all to see. The set-up was very similar to a science fair format and the room was simply electric as the students eagerly awaited their chance to describe their project. The library staff and I rotated through all the projects having the students explain what they had come up with and asking them questions about their work.

What I saw was incredibly impressive! Three of the students made their own spacesuits. One of the students had quite an elaborate homemade design featuring a detailed backpack, helmet, and boots. His teacher explained to meet that this particular student did not perform very well academically in school and was a frequent visitor to the principal's office, but when it came to building things and making projects he absolutely excelled. He was the hit of the day in his spacesuit, receiving lots of positive attention.

The school brought the kindergarten class of about 20 students in to take a look at the projects, and each got to try on this student's helmet and communications headset which was a thrill for each of them. The school principal came to review the projects as did much of the library staff along with many parents of the students.

One of the students I met told me that he had read HSWT a total of three times so far! "Each time I read it I pick up new details and understand it a little bit more" he told me. <u>It was clear to me that he will be reading more of Heinlein's works in the future. This student was hooked!</u>

Some of the other projects involved the development of a moon shovel to assist astronauts in picking up moon rocks and soil samples. Another involved moon boots which glowed in the dark to assist astronauts in the darkness and built-in jet rockets to help the astronaut explore more difficult terrain. Based on **HSWT**, another student designed an improved helmet featuring a "chin window" to allow the astronaut to more easily look straight down at his or her feet. Two female students working as a team designed a more fashionable "Girl Spacesuit" which featured sequins and was proposed to be available in many different colors.

At the end of the project reviews the students were each awarded a certificate of participation and then enjoyed a pizza lunch provided by the library. Each of them was also given a pack of freeze-dried astronaut ice cream provided through the grant to take home with them.

This was the first time I had worked with a library on the **HSWT** program, and it turned out to be a wonderful collaboration. The staff at the Enoch Pratt Public Library was thrilled to be participating in the program and in having the students read the book. In addition the teacher was thrilled to have the opportunity to expose the students to space technology and for them to have the experience to develop a project and then explain it to visitors. Everyone agreed that the program was worthwhile and there was strong consensus that we needed to do it again next year!

Student in home-made spacesuit poses along with astronaut Thomas and his mom (left), an employee at the Maryland Science Center in Baltimore.

HSWT at South River High School Edgewater, MD

Have Spacesuit Will Travel was a summer reading requirement for the 110 incoming freshmen into the STEM program at South River High School which was coordinated by two new teachers this year, Hillary Catan, the STEM program coordinator and Brendon Thomas, the Earth Sciences teacher. Having already read the book over the summer, the students were more than ready for the Sokol suit to arrive at their school.

On September 18 and 19, Dr. Don Thomas brought the Sokol suit and met with four different classes of students. For each class a presentation was given on the background of spacesuits, describing their function, the various components that make up a spacesuit, and explaining the different types of spacesuits. Then 3-4 of the students in each class were given the opportunity to try on the Sokol. At this point the students began their projects associated with **HSWT**. On October 8 & 9, Dr. Thomas returned for an additional presentation on living and working in space to help them on their projects.

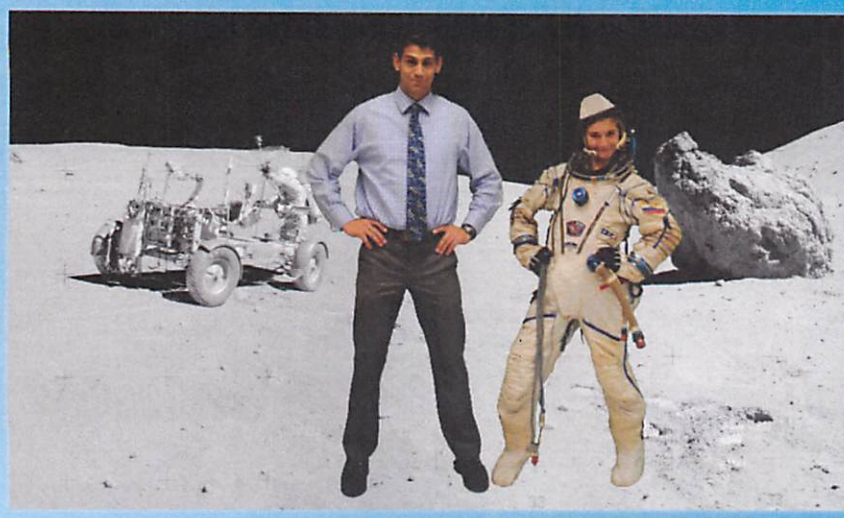
The project the students were assigned to work on for the **HSWT** program was called **Moon Missions** and involved the students working in groups or individually to design a lunar habitat that could sustain 6 astronauts for a 3 week stay on the moon.

On January 7 & 8, 2013, Dr. Thomas returned to hear their oral presentations on their lunar habitat designs. There was a wide range of ideas presented, some very practical like building an outer dome using an inflatable structure or one made out of carbon fibers arranged in an hexagonal fashion similar to Buckminster Fuller's classic geodesic dome design. Still another featured a 4-layer design with layers of lead, Kevlar, a thermal insulation layer, and an inner airtight rubber layer.

Most of their habitat designs reflected great concern for recycling and protecting the environment. Some of the proposals included recycling urine into drinking water and using methane from human waste to power their lunar rover. All designs emphasized crew comfort and habitability.

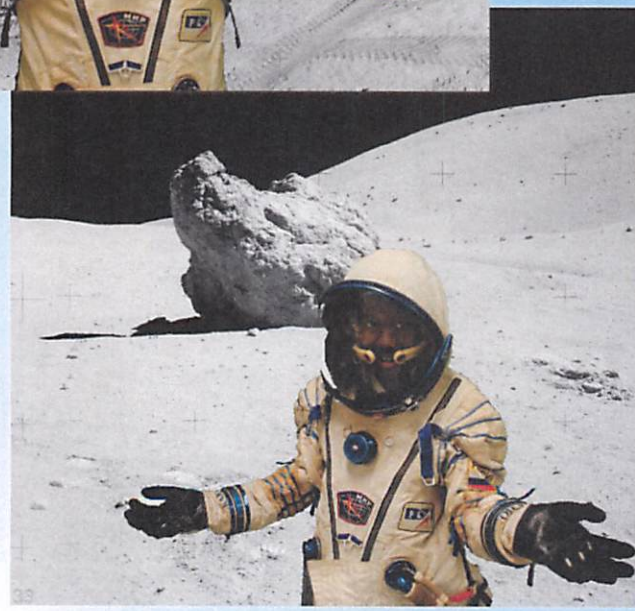
Students from South River High School try on the Sokol spacesuit during the initial HSWT visits to their school on September 18 & 19, 2012.

Students were photographed in front of a green board with a lunar scene later added to the background.

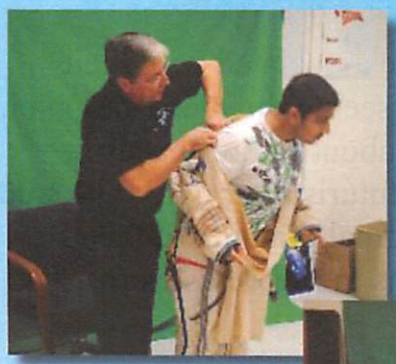


9th Grade PBL

Moon Missions



Can we create a habitat on the moon for humans?



A very special thanks to Dr. Thomas, our guest astronaut!

HSWT at North County High School Glen Burnie, MD

Once again this year the **HSWT** student projects were associated with their freshman STEM art class led by Mr. Jim Dell. After seeing the presentation on spacesuits on October 1 & 2, students read an article about future spacesuit engineering and then had to come up with their own futuristic design. The students were asked to draw initial sketches and then create a final drawing of their new spacesuit using basic forms and color. In their designs the students were asked to address the following five issues:

Mobility
Pressurized environment
Visibility
The ability to manipulate the environment
Robotic enhancements

In their projects the students were asked to add their own creative improvements to existing spacesuit designs and to be futuristic!

The designs were quite varied with some of the students focusing on the development of new exploration mobility aids while others focused on the design of spacesuits. Some of the design features the students came up with included the following:

A gel layer in the suit that would fill in a hole in the event of a meteorite penetration

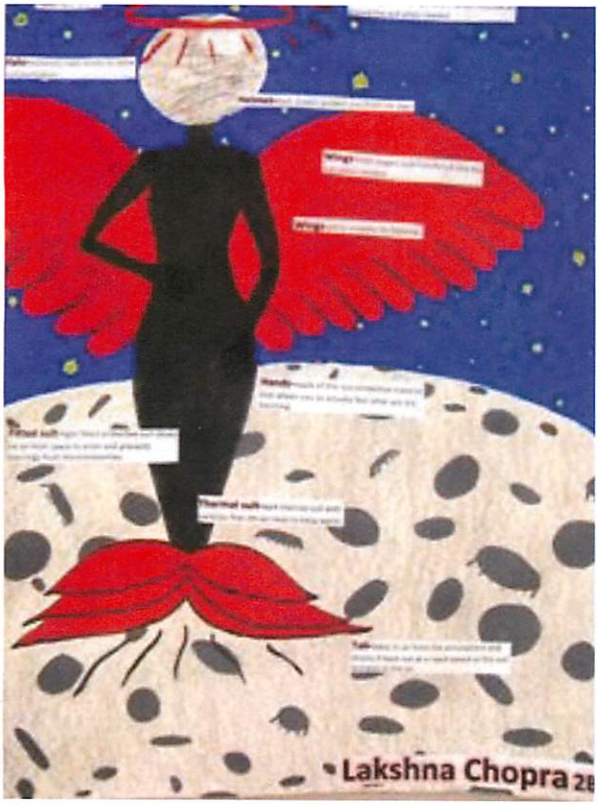
A 360-degree camera view of the outside projected on a small screen inside the helmet

Magnetic boots for walking around inside a spaceship

Magnet grappling hook – a small but powerful magnet is in a firing mechanism on the arm that it is tethered to. It can be launched at a metallic area to get yourself over there or it can be launched at tools to retrieve them

Once again this year there was a variety of feminine designs in the spacesuits created by some of the young women in the classes, one of which featured a mermaid-like design.


Darrell Nunley
Lakshna Chopra
Space Suit
Improvements


Lakshna Chopra


Advanced sensors – easily reads outside radiation levels and temperature. Also receives radio signals and precise heat sources.
BURN
Hazardous material hull – impenetrable from normal weaponry, climate extremes, and radiation.
Magnet-powered cannon – fires projectiles at extreme velocities.
Ion cannon – scatters radio signals if it strikes a receiver and disintegrates all organic material it passes through.
Flexible tentacles– capable of holding objects or supporting the hull. The legs harden at different parts to keep the craft from collapsing.
Strong grips – capable of being feet or holding objects
SOLILOQUY
HEIL
Dante Stevens

The Gumball Machine Carmen Lau 2A

Increasing the Footprint of HSWT: Additional School Visits

In order to increase the footprint of the **HSWT** program and allow for more schools and students to learn about the human body in space and the engineering and technology of spacesuits, The Russian Sokol spacesuit was brought to a wide range of presentations from public lectures to classroom visits to STEM Nights at area schools. **These presentations and appearances involved over 2,800 students, parents, and teachers** at the following locations:

Glen Burnie High School Baltimore, MD March 5,6 & April 10, 11, 2012

The HSWT program was invited to speak to 65 ninth grade students participating in a special magnet program on BioMed Allied Health at Glen Burnie High School outside of Baltimore. Over the four days spent at the school presentations were made on the human body in space, spacesuit technology, and living and working in space. The highlight for the students was being able to see a genuine Sokol spacesuit up close and to hear first-hand from an astronaut about what it was like in space.

The Paideia School Visit Atlanta, Georgia April 19, 2012

At the request of Dr. Amy Baxter, the **Have Spacesuit Will Travel** program was taken to the Paideia School located in Atlanta, Georgia, on April 19, 2012. In preparation for the visit two of the Paideia School classes involving 30 students had read Heinlein's ***Have Spacesuit Will Travel***. During four one-hour assemblies to nearly 400 elementary and middle school students, Dr. Thomas discussed what it was like to live and work in space, the purpose and different types of spacesuits, and NASA's future plans for human space travel. After two of the formal presentations for the middle school students, four of the students that read Heinlein's book were permitted to try on the Sokol spacesuit, which was one of the highlights of the assemblies.

At the end of the school day we returned to Dr. Baxter's house where an additional four students were allowed to try on the Sokol spacesuit. As always, the spacesuit was a big hit with the students and a great learning experience for them.
A few days after the visit Mary Lynn Cullen, the Elementary Coordinator at Paideia, commented on the programs that day:

"You should know that teachers and students alike cannot recall a more exhilarating assembly. Our students talked and continue to talk about the visit. Even when a slightly preposterous question was asked, you answered with full dignity and appropriate elaboration. Our students would have followed you anywhere.

Other teachers commented:

"We celebrated Earth Day on Friday, the day after your visit. I could hear students talking about the fragility of the earth, quoting you and feeling responsibility for our planet. An important message was given and fully received."

"The middle school had planned a special science club meeting along with a large assembly, and let the time run over because, as another teacher next to me breathed, 'This is a once in a lifetime opportunity'".

Many people commented on the life lessons of not giving up, and were excited by the comments that "You're the exact perfect age to go to Mars."

Dr. Baxter shared the following comments from two of the parents regarding the **Heinlein Prize Trust** visit to the Paideia School:

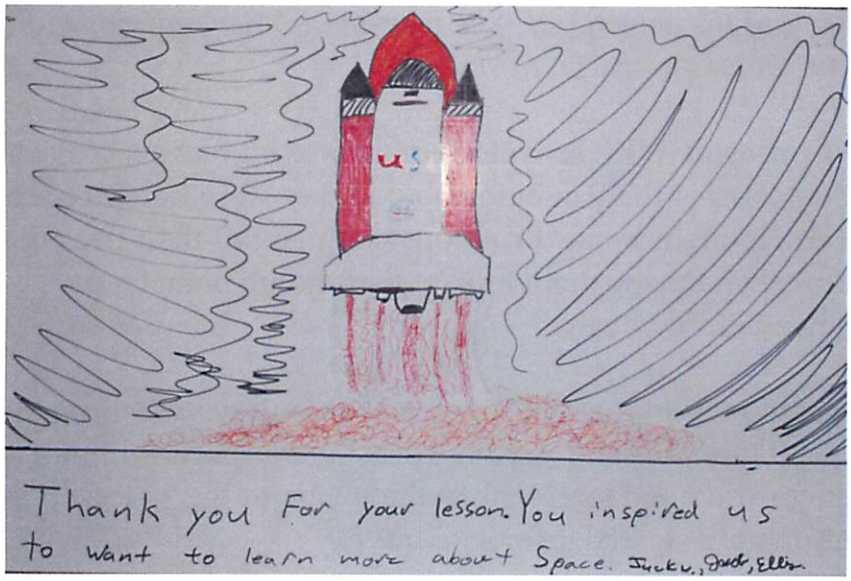
"I've never seen Noah (8th grade) so excited. He's usually is monosyllabic after school, but he couldn't stop talking about the program. He told me about how fire burns, and how Dr. Thomas tried four times before getting accepted, and how he decided he wants to be an astronaut: it fits everything he likes to do, he just didn't realize it until now."

"My daughter (3rd grade) screamed out to me after I'd tucked her in bed. I thought something was wrong and rushed in, but instead she was sitting bolt upright and realized she hadn't told me about the astronaut! She was up another half hour telling me detail after detail until she could finally go to sleep."

Without a doubt, the **Have Spacesuit Will Travel** program was a great success and had a lasting impact on the students at the Paideia School. They were both excited and inspired by the visit. The **Heinlein Prize Trust** opened many of their eyes to the possibility of future space travel and made them look at their home planet a bit differently than they had viewed it previously.

On the lighter side, I am elated to report that the Russian spacesuit passed through the TSA airport security checks at both BWI and Atlanta Hartsfield airports without incident. The x-ray screeners took a good long look at the image of the spacesuit as it passed through x-ray, but ultimately cleared it for safe travel.

Student tries on the Heinlein Prize Trust Sokol spacesuit during a HSWT visit to the Paideia School near Atlanta, Georgia on April 19, 2012.



"Thank you for your lesson. You inspired us to want to learn more about space."

Students pose with astronaut Don Thomas along with classmate wearing the Sokol spacesuit (left side of back row near edge of screen) at the Paideia School.

New Era Academy Visit, Baltimore City February1&27, April 12, 2012

In February and April the **HSWT** Program was taken to the New Era Academy High School located in the inner city Baltimore neighborhood of Cherry Hill. A series of three separate school visits was made. One involved a presentation on living and working in space. The second involved a presentation on spacesuit technology during which students were able to try on the Sokol spacesuit. A third visit involved having the students perform some hands-on science activities investigating the behavior of liquids in space. A total of 30 students participated in this series of programs.

This school is located in a severely economically depressed area of downtown Baltimore that rarely has the opportunity to participate in programs such as **HSWT.** The students proved to be extremely excited about the visits and were thrilled with the opportunity to try on the Sokol spacesuit and gloves.

Students from the New Era Academy High School in Baltimore enjoyed the visit of HSWT to their school.

Oliver Beach Elementary School Baltimore, MD February 23, 2012

On February 23, 2012 the HSWT program was invited to participate in a special STEM Night open house for parents and students at Oliver Beach Elementary School. Two presentations on living and working in space were given and the Sokol spacesuit was on display which created a lot of interest and drew a big crowd. Approximately 100 parents and students participated that evening.

STEM Night at South River High School Edgewater, MD October 3, 2012

As part of their new student recruitment program, South River High School requested that we put the Sokol spacesuit on display at their STEM Night Open House that was held on October 3, 2012. Students from South River who had participated in the HSWT earlier this year were on hand to explain to perspective students thinking about attending South River High School about the HSWT program.

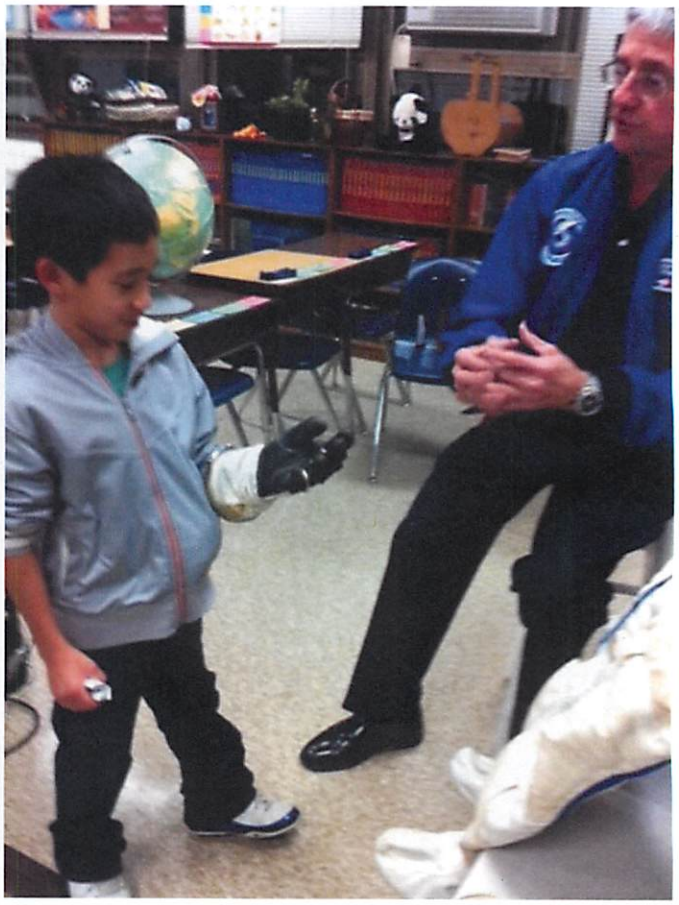
Tenth and eleventh graders at South River High School who participated in HSWT in years past were on hand at a STEM Night open house for new students to share the excitement of the program.

STEM Night at Brunswick Elementary School Brunswick, MD October 25, 2012

HSWT presented two programs at Brunswick Elementary School on living and working in space as part of their annual STEM Night open house for parents and students. The Sokol spacesuit was on display before and after the presentations for the students to get an up-close look. Total attendance was 250 people that evening.

STEM Night at Woodside Elementary School November 15, 2012

HSWT was requested to participate in a special Science, Technology, Engineering, and Mathematics (STEM) Night at Woodside Elementary School located south of Baltimore in Anne Arundel County. The program was designed to excite students about STEM fields and to give the parents more information on the STEM subjects and programs offered by their school. During the 2 hour evening open house over 300 students and parents attended, most of who stopped by to see the Sokol spacesuit that night.



Young student tries on a Russian high altitude helmet, a new addition to HSWT that was donated to the program, and one that very young students can try on.

Towson University's Saturday Morning Science Series December 4, 2012

This free lecture series features various scientists and engineers talking to young students in grades 2-8 with the goal of exciting them about future careers in Science, Technology, Engineering, and Mathematics (STEM). On December 4, 2012 Dr. Don Thomas presented a program titled "The Human Body in Space" which explained to the students some of the details on what happens to the human body in the weightless environment of space. In describing the space environment the need for spacesuits to protect the astronauts was also discussed and the Heinlein Prize Trust Russian Sokol spacesuit was displayed and used to illustrate how spacesuits protect astronauts and cosmonauts. The audience for the two lectures given this day totaled 375 individuals, roughly half students and half parents and other adults.

Believe in Tomorrow Children's Foundation visit December 4, 2012

At the request of the St. Casimir Catholic School (2012 HSWT school participant), Dr. Don Thomas was asked to donate his time for their school fundraising program for a "Lunch with an Astronaut" event during which it was planned to bring the Sokol spacesuit along. The winner of the auction then donated the lunch to an organization in Baltimore called ***Believe in Tomorrow Children's Foundation***. This organization is affiliated with Johns Hopkins University Hospitals and tries to help families of extremely sick children from out of state who are receiving treatment at the hospital. It also arranges special programs and events for the young patients similar to the more familiar Make-A-Wish Foundation.

On December 4, 2012 a visit to the Children's House was arranged during which Dr. Thomas did a special presentation on Living and Working in Space for a small

group of children and their families. The Sokol spacesuit was brought along and was a big hit with all the students, many of which were able to try on a glove or two and put on the Sokol communications cap. Besides examining the Sokol spacesuit students were able to look at space food and try samples of freeze-dried strawberries and astronaut ice cream. About 12 students and family members were in attendance.

On December 23 Dr. Thomas returned to the Children's House to meet again with one of the young boys named Trey Price whom he had met during the earlier visit. Both Trey and his younger sister Tori received space t-shirts, books, and caps as special holiday gifts from Dr. Thomas. Trey and his family, who normally live in Colorado Springs, CO, were so incredibly appreciative of having the opportunity to meet a real astronaut and to see a real Russian Sokol spacesuit that had flown in space.

Don Thomas and his son, Kai, meet with the Price family from Colorado Springs, CO. Trey, 14 years old, has been a patient at Johns Hopkins University Hospital since October 25, 2012. Trey and Tori were thrilled to put on the Sokol gloves and the communications cap and get a close-up look at the Sokol spacesuit.

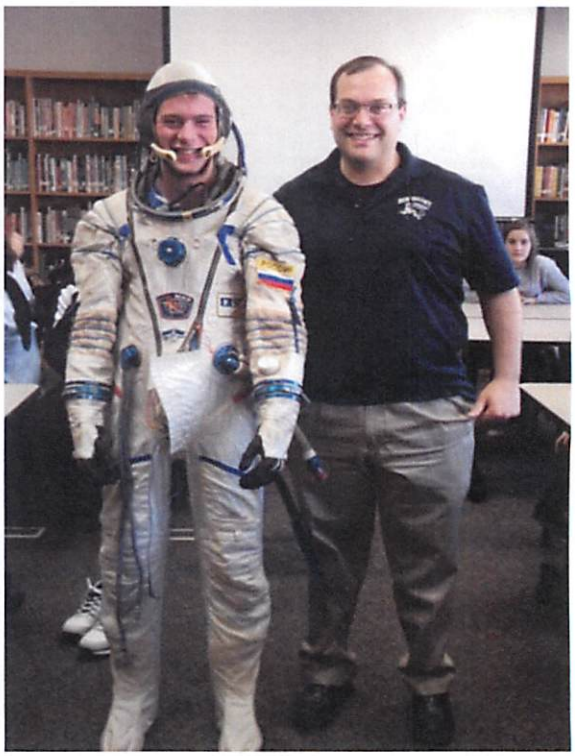
Maryvale Preparatory School Visit December 10, 2013

Dr. Thomas performed a school-wide assembly on living and working in space for 350 students at the Maryvale Preparatory School located in Brooklandville, Maryland, outside Baltimore. Maryvale is a private Catholic school for young women in grades 6-12. Afterwards two additional presentations on spacesuit technology were done for 40 of the students, mainly 11th and 12th graders who are interested in STEM careers. Four of the young women were permitted to try on the Sokol spacesuit. A local newspaper was on hand to cover the visit .

Maryvale Prep president Tracy Ford (left) along with one of her students in the Sokol spacesuit.

Sun Valley High School Visit Philadephia, PA December 13, 2012

The ***HSWT*** traveled to Sun Valley High School outside Philadelphia on December 13, 2012 where a series of three formal presentations and two informal discussions were held. The presentations focused on living and working in space as well as spacesuit technology and how they protect the human body in space. During the informal workshops a number of students were permitted to try on the Sokol spacesuit which was a big hit with everyone.



Student tries on Sokol spacesuit (left). Teacher Marc Baron and student (right) at Sun Valley High School outside Philadelphia.

Summary of 2012 Activities

Two public and one private school in Maryland participated in the full ***Have Spacesuit Will Travel*** program in 2012 involving a total of 252 students. Together with the students that participated from 2009, 2010, and 2011, **938 students have participated in HSWT to date.**

The excitement that the **Have Spacesuit Will Travel** program generates with the students is difficult to put into words but hopefully some of that excitement has been captured in the pictures presented in this report. Just one indication of their enthusiasm was the numerous pictures of themselves and their classmates in the Sokol suit that were posted on their Facebook pages the very next day! Once a student gets into the Sokol spacesuit everyone pulls out their cell phones to snap a few pictures for posting on social media sites. The students really appreciate what a unique opportunity it is for them to get inside a Sokol spacesuit that has actually flown in space!

Besides being a lot of fun, the **HSWT** experience exposes the students to new technologies that are used in both spacesuits and spacecrafts, and provides them with an opportunity to look into the future and envision the space travel that may be possible within their lifetimes. The program also lets the students develop more of their creative talents with both their oral presentations and the drawings of the Sokol spacesuit that they do in their art classes. The presentations in front of their classmates, teacher, and an outside visitor are valuable skills that they will surely use in the future in whatever career field they enter.

Expanding the HSWT Footprint: During 2012 the footprint of the **HSWT** program was extended considerable by incorporating the Sokol spacesuit to programs and presentations done at area schools. The objective of this plan was to expose even more students to space exploration and what it is like in space beyond those reading ***Have Spacesuit Will Travel*** and participating in the formal **HSWT** program. **During 2012, an additional 2,812 students, teachers, and family members had the opportunity to learn more about spacesuits and living in space, with a few of them able to try on the Sokol spacesuit. Besides Maryland, programs were conducted in Atlanta, Georgia and Philadelphia, Pennsylvania.**

Recommendations and Future Plans

The HSWT program was expanded considerably during 2012 to include school visits and other community presentations thereby vastly expanding the footprint of the program. These new opportunities allowed us to bring the HSWT program to a minority inner city school as well as to an all-female private Catholic school.

These programs were very well received with the major draw being the Sokol spacesuit. I recommend continuing efforts in this expanded **HSWT** outreach program.

An exciting new opportunity for 2012 was the involvement of a public library in the program. The Enoch Pratt Free Library (Southeast Anchor branch) located in the City of Baltimore proved to be an excellent partner in the HSWT program. Continued involvement with them and possibly other libraries is highly recommended

Acknowledgements

I would like to thank **The Heinlein Prize Trust** for making the Sokol spacesuit available and Art Dula, Buckner Hightower, and Anat Friedman for their leadership, support, and active involvement in the **HSWT** program . ***Have Spacesuit Will Travel*** helps provide a unique and invaluable learning experience for many students, some of which may become our country's next generation of explorers.

Thank you note from Paideia School student