Volume 24.1
Spring 2014
First Quarter

PSF NEWS

Planetary Studies Foundation

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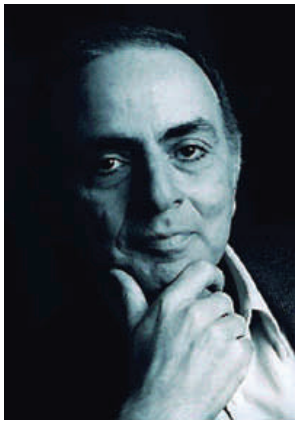

During his nearly three decades at Cornell, Carl Sagan became the best-known scientist on the planet. Unlike previous celebrity researchers, Sagan didn't achieve fame from a singular breakthrough such as Jonas Salk's polio vaccine or Albert Einstein's general theory of relativity. Sagan made significant contributions to planetary research, but his renown derived from his extraordinary ability to communicate the wonders and complexities of science to his students—both in Cornell's lecture halls and in the wider world he made his classroom.

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FORTY BILLION POTENTIALLY HABITABLE PLANETS By Herb Windolf

What we, as humans, consider "habitable" must mean habitability for oxygen-breathing, land-based animal life, not only microbial life.

A continuing question is how many planets may orbit the estimated 200 billion stars in the Milky Way Galaxy, and how many of those could support life as we know it? For scientists – but hardly for the general population – it is an important question whether or not life is common in the universe.

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MEMBER SPOTLIGHT: JIM DOLE
PSF Director, JETS Observatory

Jim Dole serves as the PSF Director of the JETS Observatory located in Freeport, Illinois. Under the direction of Jim, the observatory offers public viewing sessions and educational programming on alternate Saturday evenings from May through September, and for special astronomical events.

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EVENTS, MEMBER NEWS, PHOTOS AND MORE!

PRESIDENT'S MESSAGE

The first quarter of 2014 has been one of the most action-packed periods in our long history. 2013 ended on a very good note with so many accomplishments to look back on, and the anticipation for 2014 was very high. The year began with extreme sub-zero temperatures and high winds creating conditions reminiscent of our experiences in Antarctica. Many homes and businesses in the area suffered from frozen pipes and faulty furnaces, but our two facilities seemed to be unaffected. All that changed on January 7th when we entered our *1876 Banwarth House & Museum* and discovered water covering the kitchen and dining room floors. Further inspection of the basement revealed a scene that looked more like a tropical rainforest than our nice dry museum. Water was pouring down from the ceiling soaking our antique furniture and other historic items, many damaged beyond repair. Apparently, a connecting valve to the dishwasher had burst and water had been leaking for at least two days. Our January water bill showed that we were 5,000 gallons over our normal usage. Fortunately, PSF has homeowners insurance and our company paid for the clean-up and repair service charges less our $1,000 deductible. As for the damaged furniture and destroyed historical materials, we did receive fair compensation for their loss, but so many items were irreplaceable. Currently, the main and upper floors of the *1876 Banwarth House & Museum* are functional and open to the public, but the basement remains closed until we can affect further repairs.

If the flood at the *1876 Banwarth House & Museum* wasn't enough stress, the thirteen glass display cases that we ordered at the end of November arrived in a snowstorm on that same day. Making matters even worse was the fact that it was a "tail-gate" delivery and we had no shipping dock to unload them. Unloading these cases would have been impossible without the use of a forklift truck provided by **Hoskins Building Center** and immediate help from **Roberts Plumbing.** Other neighbors also stepped-up providing their "muscle", and all thirteen cases made it safely into the building. This is one of the benefits of being located in a small town. When you are in trouble you can always count on your neighbors to help out. In spite of the shaky start the new *Earth & Space Science Museum* is open and has been well received by the community. PSF members **Max and Martha Purchis** and **Wanona Wellspring** and her husband **Bill Ceisel** donated office furniture, and **Nate and Karen Greiner** donated a computer, printer, and office desks. PSF member **Conrad Wragg** also made a major contribution to our new museum by loaning us several important meteorites and dinosaur fossils from his personal collection.

On February 8th, over 60 people attended our Grand Opening and 25th Anniversary Celebration Event. Our guests included Village President **Michael Dittmar**, River Ridge School Superintendent **Brad Albrecht** and Kenosha, WI radio station WLIP personalities **Frank, Kim and Brooke Carmichael**. Highlighting the event was a check presentation from **Roberta Cunningham** for $1,127 coming from her community donation program at her *Little Folks Trading Post* in Dubuque, Iowa. Our sincere thanks to Roberta for getting us off to a very good start! Since the Grand Opening the new museum has been open on select weekdays and from 10:00am to 4:00pm on Saturdays. It offers StarLab planetarium shows at 11:00am and 1:00pm along with special lectures, Sci-Fi Saturday movies and guest performances. The museum also hosts monthly meetings and special programs for the *Elizabeth Historical Society*. PSF is honored to offer its facility and services to other not-for-profit organizations in our community. Looking ahead to all the various community events planned by the *Elizabeth Chamber of Commerce* we hope for a very exciting and rewarding spring, summer, and fall seasons. Please come out and see your PSF in action. You won't be disappointed!

Paul P. Sipiera

DONORS' SPOTLIGHT

$1,000-$1,500

Roberta Cunningham of
Little Folks Trading Post (Dubuque, IA)

$500 -$999

David M. Lauerman
Diane & Paul Sipiera

$100-$499

Herb Windolf

$25-$99

Kate R. Butler
Friends of Wapello of
Jo Daviess Conservation Foundation (Jo Daviess County)
Helen Kilgore
Michael & Ashley Maynard

Thank You to 2013 PSF Members Who Gave Their Time

Money is always extremely valuable in any business, but giving time is just as important. Last year we had an abundant of individuals who stepped up.

Our sincere thank you goes to Leo & Karen Baran, Jim & Lu Paglin, John & Maxine Pokornik Max & Martha Purchis, Phil Gabel, Alan & Janice Myelle, Alan Reed, Jerry Speer, Jim & Pat Tierney, Jeff & Judith Glenn, John & Jane Yoder, Jim & Beth Baranski, Hannah Jackson, Jim Dole, Tom Dunmore, Sheila Magnus, Bill Ceisel & Wanona Wellspring Ceisel, Wulf Clifton & Christina Hollis, Nate & Karen Greiner, Dave Lauerman, Dick Friedman, Larry Pavell, Randy Shaw and Conrad Wragg.

THANK YOU!

JETS-FIREBAUGH OBSERVATORY PROJECT

$1,200

Anonymous

$100

Citizens State Bank (Lena, IL)
Midwest Community Bank (Freeport, IL)
State Bank (Freeport, IL)

At the August 2013 PSF Executive Board Meeting, the board approved the 'Douglas Firebaugh Astronomical Observatory' project and committed $7,000 toward the total cost of $15,965. The PSF became involved with this project through its strong relationship with PSF member, **Jim Dole**, and the *JETS Observatory* owned by the Freeport Park District. Under Jim's direction, the observatory was re-opened and offers public viewing sessions and educational programming in Freeport, Illinois on alternate Saturday evenings from May through September.

In an effort to increase the observatory's capabilities, the PSF added its 18-inch Dobsonian reflector telescope to complement the existing battery of telescopes. This addition, while important and exciting, also created the need for a traditional astronomical domed structure to the top of the observatory.

To date, an additional $2,000 has been pledged by several individuals from the Freeport community to PSF's pledge of $7,000. Additionally, the project has been promised free labor and building materials to help reduce the overall cost. If you or your business are interested in donating, please send a check to the PSF and designate it for the Firebaugh Observatory.

MEMBER'S CORNER

NEW MEMBERS

FAMILY	INDIVIDUAL
Roberta Cunningham Family	Tammy Trebin
Frank, Kim & Brooke Carmichael	
Randy Rice & Rebecca Shriver	

RENEWING MEMBERS

FAMILY	INDIVIDUAL
Jim, Beth & Alex Baranski	Jan Buedel
Leo & Karen Baran	Larry Knight
Jim and Sandy Napolitan	Bill Schooley
Dan, Pam & Grace Tindell	Paul A. Solarz

MEMBER NEWS

- Congratulations to **Mike Zolensky** who will be president of the Meteoritical Society Council (MetSoc Council) 2014 and **Trevor Ireland** who is vice-president. **Trevor Ireland** will be taking over the president position in 2015-2016. Every year, the Planetary Studies Foundation presents the Meteoritical Society with two travel grants for students to attend the annual meeting. This year's summer meeting will be held in Casablanca, Morocco.

- Condolences to **Mike Caplan**, his father passed away recently.

- **Loren and Evelyn Acton** were busy in 2013. Loren is still a part-time research professor at Montana State University. Also, Loren gave a talk in Japan in connection with a space/science meeting this past November. The great news is that Evelyn had a wonderful plum crop and made delightful jam. Their highlight was on expedition on a four-masted barquentine ship to see a total eclipse.

- **Bill and Mary Sue Coates** had a very busy year. They went on cruise to the Western Caribbean, Mexico, Guatemala and Honduras. They visited several sites, including Tikal. Also, in late October, they spent three weeks in Italy visiting Rome, Florence and Venice.

- **Jerry and Elena Marty** spent time in South America to tour Patagonia (Argentina and Chile). They learned a lot about the geography, indigenous people, and spent quality time cruising the fjords. Jerry still works at the South Pole.

- **Art and Damaris Mortvedt** were busy preparing for Art's accomplishment to reach the North Pole. His Cessna 185 now has gone to both poles. Art had the opportunity to speak at the 2013 Oshkosh Air Show in Wisconsin where his plane, *Polar Pumpkin*, was on display. They absolutely love living in Manley Springs, Alaska.

- New Zealand and Australia were dreams come true for **Jim and Sandy Napolitan**. They had an opportunity to snorkel off the Great Barrier Reef. Last fall, they went to Dubai and Oman. While in Dubai, they went to Burj Khalifa, the tallest building in the world to see a partial solar eclipse from the top floor. How exciting!

PHOTO WALL FROM THE MUSEUMS

PSF EARTH & SPACE SCIENCE MUSEUM

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www.planets.org

Email
dsipiera@planets.org

Phone
815.858.2014

Twitter
@PSF1989

Linkedin Group
Planetary Studies Foundation

Facebook
Planetary Studies Foundation

Above from left to right: Front window of the Earth & Space Science Museum, Grand opening ribbon cutting ceremony with Dave Winter (Elizabeth Banking Center), Mike Dittmar (Elizabeth Village President), Caroline Sipiera, Brad Albrecht (Superintendent, River Ridge High School), Nathan Greiner (Design Mill Inc) and Jess Farlow (PSF Executive Board Member).

Above from left to right: Brooke Carmichael in the Apollo Room "holding the world in her hands", Donation ceremony from *The Hanger* (Dubuque, IA) with Diane Sipiera, Roberta Cunningham, Paul Sipiera and Paula Sipiera and the amazing dancers from the Irish stepping presentation.

1876 BANWARTH HOUSE & MUSEUM

Clockwise: Group photo of the lovely ladies from the Evans family from Kalona, Iowa; a rag doll workshop, and a handkerchief doll making class, taught by Martha Purchis and Jolene Foat.

Website
www.banwarthmuseum.com

Email
info@banwarthmuseum.com

Phone
815.858.2014

Facebook
1876 Banwarth House & Museum

INTERVIEW SPOTLIGHT

JIM DOLE

PSF DIRECTOR, JETS OBSERVATORY

Jim Dole serves as the PSF Director of the JETS Observatory located in Freeport, Illinois. Several years ago, the PSF was given the opportunity of re-opening and operating the JETS Observatory, owned by the Freeport Park District, and located on the Park Hill Golf Course. Under the direction of Jim, the observatory offers public viewing sessions and educational programming on alternate Saturday evenings from May through September, and for special astronomical events.

What profession have you worked in and what lead you into that career?

My primary job (career I suppose since it has been for over 16 years) is IT support in a manufacturing environment. I started out as a computer programmer, but for the last 13 years, I've worn a more universal IT 'hat' of user, hardware, and systems support. I started my education by taking some college courses while serving in the U.S. Air Force. Once out of the Air Force, I worked in manufacturing while I continued to further my college education. Initially, my plan was to become a high school science and math teacher; I liked math and I liked science so it seemed like a good fit for me. As I moved along my educational path, I came to a point that required a course in computer programming. The first couple of weeks of that course were difficult for me and I started wondering if I could even finish it? I started to ask more questions in class and with the excitement that came from creating that first computer program that actually worked, the class became easier. In fact, I ended up getting the highest grade in the class and one day the instructor pulled me aside after class and suggested that I consider pursuing computer science. After enjoying that course and learning so much, a look at the job forecast resulted in a change of my major. I graduated with a Bachelor of Science degree in applied mathematics and computer science, and I guess on that topic, the rest is history! Since that time, I have continued with my education and completed a Master of Science degree in both computer information systems and astronomy.

My second profession, and the one that I get excited about, is that of teaching an introductory astronomy course at Highland Community College. I have taught class there for the last seven years and thoroughly enjoy doing it.

What are some of your hobbies?

Astronomy is my biggest hobby, though I do like to do wine tasting with my wife and enjoy an occasional round of golf. I started out in astronomy at the age of nine when my parents gave me a 40mm telescope. I had looked at the Moon several times and though it was neat, but what really got me was one morning when I looked at a bright 'star' that I had seen in the sky. It was the planet Jupiter and I could see the cloud bands and four Galilean moons…I WAS HOOKED! Since that time I have, of course, purchased several telescopes and have even built three different backyard observatories. The first one my father and I built when I was fifteen to house the 6" Criterion Dynascope RV6 that I bought with my paper route money.

Where is your favorite place you have traveled and why?

My wife and I enjoy an annual trip to wine country in Napa and Sonoma, California. We like to relax and enjoy good wine and nice dining. Other than that, Key West and Seattle are frequent destinations.

What is your favorite area of science and why?

Astronomy is by far my favorite area of science. That in itself is very broad. I enjoy observational astronomy and have several telescopes of my own. I've dabbled with some success in astrophotography and CCD imaging, and am now getting ready to include video astronomy to the list. Sharing my knowledge and enthusiasm for astronomy continues to be a rewarding experience. Luckily I get to share this in teaching, visiting schools in the community, and in public outreach as the PSF Director of JETS Observatory in Freeport.

How exactly did you get involved in PSF?

Going on three years now, I'm a newer member of PSF. My involvement with the organization was somewhat of a 'meant-to-be' thing. Since 2001, I was the director of the JETS Observatory in Freeport, Illinois. The JETS was a Freeport High School (FHS) science club that, sadly due to a lack of interest from the high school, disbanded in 2009. The observatory itself has been in operation since 1967. The JETS club was started and directed by Mr. Doug Firebaugh, a science teacher at FHS, until his retirement in 2001. I had already been on the club's adult board, and with Mr. Firebaugh's retirement, was voted to direct the observatory operations to keep operations stable at a time when the prospects of getting a replacement high school teacher for astronomy were not. By 2009 the student involvement at the observatory was gone and the JETS board decided to disband.

The observatory is located on Freeport Park District property, and is in fact their building. So, I addressed the Freeport Park Board to let them know a small group of amateur astronomers, myself included, wanted to keep the observatory running so they had nothing to worry about. Well, I found out that it would not be that easy. Being part of a high school organized club, JETS had liability coverage; being under a group of a couple of interested amateur astronomers there was none. We had to close the doors of the observatory for one season, and during that time, with the help of the park district superintendent, the Planetary Studies Foundation was brought to my attention. At the time, I didn't know anything about the PSF so I called Paul Sipiera to learn about the organization, and to explain my dilemma. The goals of the PSF to foster scientific literacy and promote science, coupled with the observatory and its long established presence in the community, was a perfect match. The observatory is now back in operation with two staff members (Tom Dunmore and myself) and we are both PSF members.

What is one of your most memorable stories about PSF?

Paul Sipiera and David Lauerman visited the observatory during the open house in April of 2013 and brought with them ideas of expanding the observatory with the relocation of a JMI 18" reflecting telescope and thoughts of building a domed observatory structure at the observatory site. We are now looking forward to making this expansion a reality.♦

Observatory Expansion Project Update

In the year since that initial discussion, a lot has happened toward the project:

- The 18" telescope has been moved to the observatory where Tom Dunmore has done a remarkable job restoring it to look like new.
- The Park District has agreed to the construction of the building.
- Construction plans have been drawn up.
- Material cost quotes have been received.
- Fundraising efforts are underway

If this project is funded and completed, the expansion will provide both an ADA compliant facility for astronomy that was not previously available and with newer technologies, enhanced learning and interest in astronomy. Included in the plan is a dedication and renaming of the observatory to the *Douglas Firebaugh Astronomical Observatory* in honor of its founding director.

CALENDAR OF EVENTS

LECTURE SERIES & WORKSHOPS

STARLAB PLANETARIUM: SPRING CONSTELLATIONS

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, APRIL 12TH
11:00AM

TRIBUTE TO APOLLO 13 & PSF MEMBER, JIM LOVELL

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, APRIL 12TH
1:00PM

In an instant, the Apollo 13 spacecraft pivoted from a moon-bound landing unit to a crippled vessel. While the spaceflight stands today as a demonstration of NASA innovation saving lives on the fly, Apollo 13 vividly illustrated the dangers of people working in space. A tribute to Apollo 13 and Jim Lovell will take place, followed by a viewing of the Apollo 13 movie.

LUNAR ECLIPSE

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, APRIL 12TH
7:00PM

Join the PSF and learn about this magnificent astronomical event with Paul Sipiera, Ph.D. planetary geologist. The actual lunar eclipse will be early Tuesday, April 15th starting at 1:07 a.m. mid-eclipse at 1:47 a.m. and ending at 2:25 a.m.

STARLAB PLANETARIUM: SPRING CONSTELLATIONS

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, APRIL 19TH
11:00AM AND 1:00PM

WORKSHOP: CROCHET JEWELRY BAG WORKSHOP

1876 BANWARTH HOUSE & MUSEUM
SATURDAY, APRIL 19TH
12:30-2:30PM

Learn how to crochet a dainty little bag for holding jewelry. Jolene Foat will guide you through the process of simple crochet stitches and reading a pattern. In this afternoon workshop you will learn how to make a chain, add stitches and take them away. Please bring a crochet hook and yarn. A $10 donation or $5 for PSF Members is requested. Please reserve a place by Thursday, April 17th by leaving a message at the PSF Office (815) 858-2014 or emailing info@banwarthmuseum.com. No walk-ins will be accepted.

STARLAB PLANETARIUM: SPRING CONSTELLATIONS

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, APRIL 26TH
11:00AM AND 1:00PM

STARLAB PLANETARIUM: SPRING CONSTELLATIONS

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, MAY 3RD
11:00AM

HISTORY OF WOMEN'S BATHING SUITS

1876 BANWARTH HOUSE & MUSEUM
SATURDAY, MAY 3RD
1:00-2:00PM

What did women wear before that itsy bitsy bikini? Learn how bathing suits evolved from full length costumes to mere traces of fabric. From the Victorian bathing machine to the introduction of the bikini, this presentation is sure to make waves.

STARLAB PLANETARIUM: SPRING CONSTELLATIONS

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, MAY 10TH
11:00AM

ASTRONOMY IN THE 1800s

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, MAY 10TH
11:00AM

Learn about the history and practice of astronomy and the significant astronomical discoveries of the 1800s.

SPINNING WHEEL ROUND & ROUND

1876 BANWARTH HOUSE & MUSEUM
SATURDAY, MAY 17TH
1:00-2:00PM

Spinning was hailed as the most worthy of a woman's tasks up until the Industrial Revolution. Spinning wool and other fibers into something more useful has become a lost art since that time. Or so it appears… Stop by the 1876 Banwarth House & Museum and rediscover the craft of spinning. Award winning spinner, Jolene Foat, will share her knowledge of the spinning wheel, drop spindle, various wools and fibers, along with timeless spinning techniques.

STARLAB PLANETARIUM: SPRING CONSTELLATIONS

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, MAY 24TH
11:00AM

GHOST STORIES

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, MAY 24TH
1:00PM

Listen as Diane Sipiera tells tales of creepy happenings and ghostly experiences during this haunting program.

STARLAB PLANETARIUM: SUMMER CONSTELLATIONS

PSF EARTH & SPACE SCIENCE MUSEUM
SATURDAY, MAY 24TH
11:00AM AND 1:00PM

Learn the Greek mythology behind the constellations of Scorpio, the Serpent Holder, Hercules, Libra, Bootes, Capricorn, Sagittarius and Aquarius.

Be sure to follow the Planetary Studies Foundation on social media for the latest updates, changes and event details!

Website: www.planets.org
Facebook: Planetary Studies Foundation
Twitter: @PSF1989

1876 Banwarth House & Museum
Website: www.banwarthmuseum.com
Facebook: 1876 Banwarth House & Museum
Twitter: @PSF1989

Event Sites:

1876 Banwarth House & Museum
408 E. Sycamore Street, Elizabeth, Illinois

PSF Earth & Space Science Museum
115 N. Main Street, Elizabeth, Illinois

****All programs are free for PSF Members and $5.00 for the general public unless otherwise noted.**

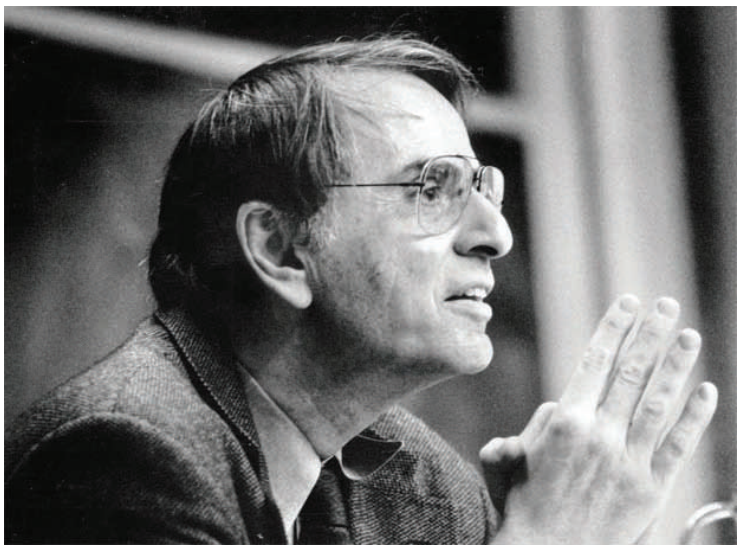
PSF Life Member and Cornell Alumnus, Ryan Nolan, sent in this article from Cornell Alumni Magazine, who so kindly let us do a reprint. An excellent, in-dept look of the early career of Carl Sagan.

From Cornell Alumni Magazine, March/April 2014

THE SAGAN FILES

A voyage through the famed astronomer's archive, now at the Library of Congress.

By Bill Sternberg



Carl Sagan, 1995

During his nearly three decades at Cornell, Carl Sagan became the best-known scientist on the planet. Unlike previous celebrity researchers, Sagan didn't achieve fame from a singular breakthrough such as Jonas Salk's polio vaccine or Albert Einstein's general theory of relativity. Sagan made significant contributions to planetary research, but his renown derived from his extraordinary ability to communicate the wonders and complexities of science to his students—both in Cornell's lecture halls and in the wider world he made his classroom.

Sagan's papers, open to the public at the Library of Congress since November, range over topics as majestic as outer space and as mundane as office space. (If you took Astronomy 102/104 in 1977, your grades are in Box 254.) A sampling of the academic files sheds light on Sagan's years in Ithaca, from the story of how he came to Cornell to his transformation into the finest science educator of the Space Age generation to his courageous battle against the rare disease that claimed his life at sixty-two.

1967–68 Sagan, who had joined the Harvard faculty as an assistant professor in 1962 when he was twenty-eight, was seemingly on the fast track when he received the stunning news that he would not get tenure. The reasons weren't clear; there were murmurs that his overriding passion—exobiology, the search for extraterrestrial life—was a discipline without a subject matter. Regardless of why, Sagan began looking for employment elsewhere.

After being rebuffed by MIT, he found himself recruited by Tommy Gold, director of Cornell's Center for Radiophysics and Space Research. Gold, who was trying to build a world-class astronomy department, was impressed by Harvard's brash young astronomer, but then-Provost Dale Corson had reservations. "Dale, you will not ever regret this," Gold assured him.

Sagan's lack of negotiating leverage didn't prevent him from spelling out what it would take to bring him to Ithaca. "For me to accept your kind offer to come to Cornell, I would require some firm assurance that the level of staffing, space, and support be slightly above the level outlined," he wrote in a four-page letter in June 1967. Six months later, Gold responded with the offer of an associate professorship, with tenure and an initial salary of $15,000 a year. Gold helped seal the deal by bringing him to Treman State Park, where Sagan was impressed by the area's natural beauty.

On January 22, 1968, the Board of Trustees formally appointed Sagan an associate professor in the Department of Astronomy. He responded on Valentine's Day that he was "delighted to accept" and looked forward to a long period of association with Cornell. The relationship would last nearly half his life.

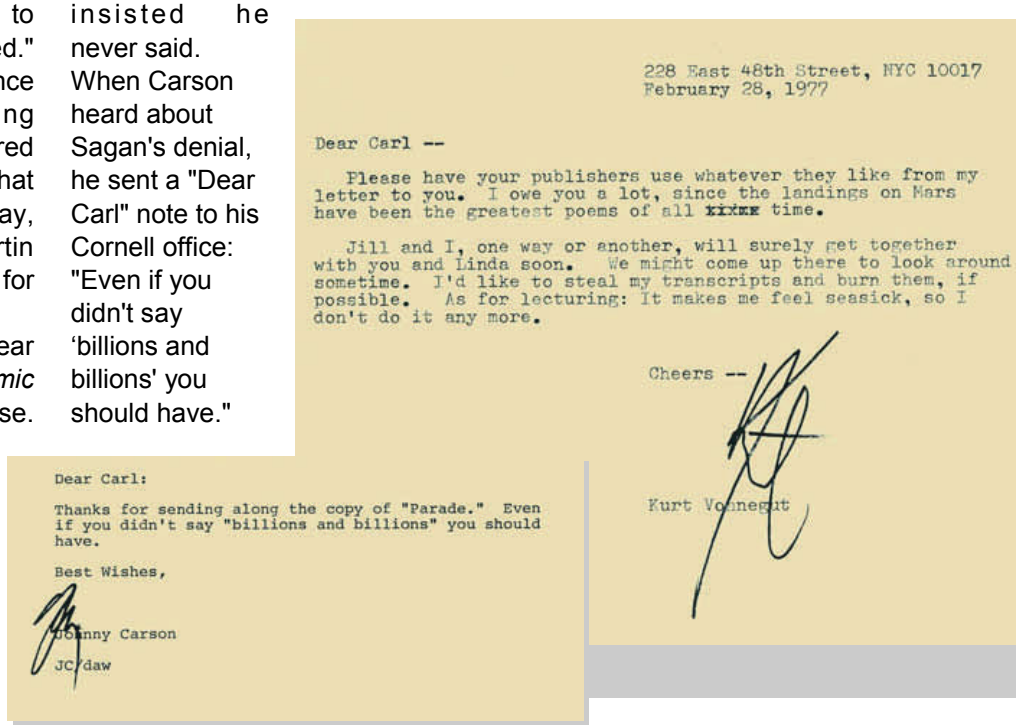
It wasn't until five years later that Sagan learned why he'd been snubbed by Harvard and MIT. One of his mentors at the University of Chicago, Nobel laureate Harold Urey, had given him negative references, characterizing Sagan's research work as wordy, often useless, and not to be trusted. Urey later changed his mind and apologized, asking for forgiveness and friendship. "I have been completely wrong," he wrote on September 17, 1973. "I admire the things you do and the vigor with which you attack them." By then, of course, Cornell had already pulled off the greatest Massachusetts-to-New York exchange of talent since the Red Sox sold Babe Ruth to the Yankees in 1920.

1973 Sagan quickly gained a

reputation as an unusually engaging lecturer. In spring 1973 he taught Astronomy 102 with Frank Drake '51, known for devising an equation to estimate the number of intelligent civilizations in the Milky Way. "The room is overflowing," Drake wrote to him, "and we are oversubscribed." That April, a discussion on "Science and Science Fiction"—featuring Sagan, Gold, Isaac Asimov, and Fred Hoyle—attracted so many people that hundreds got stuck in the hallway, including astronomy chair Martin Harwit, who publicly apologized for the "fiasco."

With the publication that year of Sagan's new book, *The Cosmic Connection*, his star continued to rise. He went on Dick Cavett's TV show to talk about the possibility of contact with intelligent life on other planets. Johnny Carson, a knowledgeable amateur astronomer, happened to catch the show and was impressed. Sagan was invited to appear on "Tonight"—but as a relative unknown he was relegated to five minutes at the end of the show, following a talking crow and harmonica-playing hillbillies.

He used the time well, and Carson invited him back three weeks later for a half-hour segment. Sagan's topic this time was nothing less than the history of the universe. "Fifteen billion years ago, the universe was without form," he began. "There were no galaxies, stars, or planets. There was no life. There was darkness everywhere." A *New York* magazine reviewer called it "one of the great reckless solos of late-night television." Sagan would go on to make two dozen more appearances on the Carson show, spreading his gospel of science to its 10 million viewers. Back in Ithaca, students would greet his return to the classroom with Ed McMahon-like shouts of "He-e-e-e-re's Carl!" Carson later introduced a Sagan impression, donning a black wig, turtleneck sweater, and corduroy jacket and intoning "*bill-yuns and bill-yuns*." Thus Sagan, in one of the many ironies that marked his life, became perhaps best known for something he insisted he never said. When Carson heard about Sagan's denial, he sent a "Dear Carl" note to his Cornell office: "Even if you didn't say 'billions and billions' you should have."



228 East 48th Street, NYC 10017
February 28, 1977

Dear Carl --

Please have your publishers use whatever they like from my letter to you. I owe you a lot, since the landings on Mars have been the greatest poems of all xxxx time.

Jill and I, one way or another, will surely get together with you and Linda soon. We might come up there to look around sometime. I'd like to steal my transcripts and burn them, if possible. As for lecturing: It makes me feel seasick, so I don't do it any more.

Cheers --

Kurt Vonnegut

Dear Carl:

Thanks for sending along the copy of "Parade." Even if you didn't say "billions and billions" you should have.

Best Wishes,

Johnny Carson

JC/daw

1977 It was perhaps inevitable that Cornell's most famous scientist and its most famous dropout, both best-selling authors, would cross paths. Kurt Vonnegut '44, who had spent three years on campus trying to become a scientist before leaving to serve in World War II, had given a favorable review to Sagan's first book, *Intelligent Life in the Universe*, written in 1966 with Soviet scientist I.S. Shklovskii. In 1977, Sagan sent Vonnegut a copy of *The Dragons of Eden*, his excursion into the origins of human intelligence that went on to win the Pulitzer Prize. "I'm so glad to have *The Dragons of Eden*, a shapely companion for *The Cosmic Connection*," Vonnegut wrote back. "You make it so easy for a lazy person like me to have some inkling, all the same, of what may really be going on. All this new information is going to have to be incorporated into sermons by and by." Vonnegut went on to discuss plans for a new work of science fiction, which opened with a message to Earth from the planet Tralfamadore.

Sagan thanked Vonnegut for the message from the Tralfamadorians and wondered whether there is "any chance of you visiting your old Alma Mater—say, to give a university-wide lecture?" To which Vonnegut replied: "We might come up there to look around sometime. I'd like to steal my transcripts and burn them, if possible. As for lecturing: It makes me feel seasick, so I don't do it any more."

1980–81 Although Sagan was already well known beyond Cornell, it was "Cosmos," seen by more than 500 million people in sixty countries, that propelled him into the stratosphere and earned him such sobriquets as "the prince of popularizers" and "the cosmic explainer." In thirteen hour-long episodes, Sagan served as a

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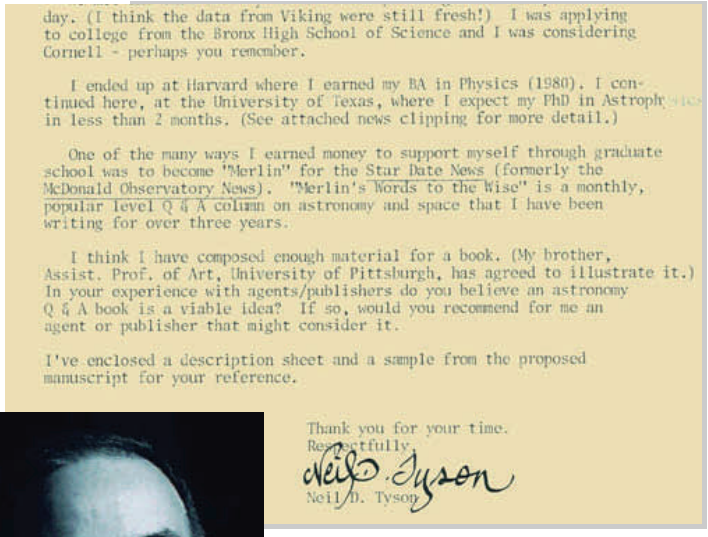
telegenic tour guide to the universe, with an engaging sprinkling of philosophy, religion, music, art, and history along the way.

When Sagan returned to Ithaca after a two-year leave to make "Cosmos," his international celebrity attracted a deluge of appeals for interviews, invitations for speaking engagements, requests for career advice, fan mail, and letters from crackpots (which were placed in bulging files labeled "fissured ceramics"). To protect Sagan and Shirley Arden, his dedicated and swamped assistant, a special alarm system was installed in the Space Sciences Building.

In January 1981, Harold Urey died of heart disease at age eighty-seven. Sagan wrote a long obituary for the journal Icarus hailing him as one of the founders of modern planetary science. Deep in the obituary was this cryptic sentence: "I remember his willingness to change his mind in a case where he had blocked the advancement to tenure of a young scientist at another institution and then later asked to be forgiven."

1988 By his twentieth year in Ithaca, Sagan was growing frustrated by what he called "the almost imperceptible level of Cornell financial support for my work." In a confidential memo to the director of the Center for Radiophysics and Space Research and the chairman of astronomy, Sagan pointed out that between May and December, he had contributed $31,995 to cover costs associated with office equipment and a senior research associate. "By comparison, my half-time salary at Cornell for academic year 1987–88 is only $29,500. I am in the absurd situation of contributing more money to Cornell than Cornell pays me." Sagan proposed that "an equitable solution" would be for the University to increase non-salary funds to support his research and other activities by an additional $35,000 a year—though even that "would not equal the level of non-salary support that other universities and institutions continue to offer me."



day. (I think the data from Viking were still fresh!) I was applying to college from the Bronx High School of Science and I was considering Cornell - perhaps you remember.

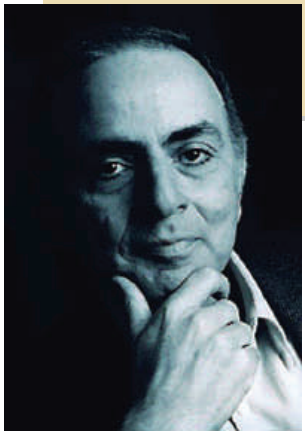
I ended up at Harvard where I earned my BA in Physics (1980). I continued here, at the University of Texas, where I expect my PhD in Astrophysics in less than 2 months. (See attached news clipping for more detail.)

One of the many ways I earned money to support myself through graduate school was to become "Merlin" for the Star Date News (formerly the McDonald Observatory News). "Merlin's Words to the Wise" is a monthly, popular level Q & A column on astronomy and space that I have been writing for over three years.

I think I have composed enough material for a book. (My brother, Assist. Prof. of Art, University of Pittsburgh, has agreed to illustrate it.) In your experience with agents/publishers do you believe an astronomy Q & A book is a viable idea? If so, would you recommend for me an agent or publisher that might consider it.

I've enclosed a description sheet and a sample from the proposed manuscript for your reference.

Thank you for your time.
Respectfully,
Neil D. Tyson
Neil D. Tyson



Sagan's discontent got the attention of Day Hall. In a letter from Provost Robert Barker, the University offered an additional $30,000 in honoraria in exchange for two public lectures a year. That summer, Sagan delivered the freshman orientation talk in Bailey Hall.

"I think if you play your cards right you can have an excellent educational experience at Cornell," he said. "And it's even possible that it can be a character-building experience, but that's a much iffier prospect—much more up to you."

1994 To honor Sagan's sixtieth birthday, Cornell sponsored a symposium on October 13–14. (Sagan was born on November 9, but the event was scheduled a month earlier to avoid problems with Ithaca's notoriously fickle weather.) A galaxy of scientists, diplomats, artists, and journalists converged on the campus. Also in attendance were Sagan's five children from three marriages, one born in each decade from the Fifties to the Nineties.

Bailey Hall was standing-room-only for Sagan's keynote lecture on "The Age of Exploration." As the lights dimmed, he pointed to a tiny pixel of light projected on a giant screen above him. He identified it as a photograph of Earth taken by the Voyager spacecraft as it departed the solar system. Sagan had persuaded NASA to adjust the cameras for this final, backward glance.

The auditorium was hushed except for Sagan's signature, cadenced voice. That night, he delivered one of his most memorable lectures, one that struck some in the audience as almost biblical in tone and message:

Look again at that dot. . . . On it everyone you love, everyone you know, everyone you ever heard of, every human being who ever was, lived out their lives. . . .

The Earth is a very small stage in a vast cosmic arena. Think of the rivers of blood spilled by all those generals and emperors so that, in glory and triumph, they could become the momentary masters of a fraction of a dot. Think of the endless cruelties visited by the inhabitants of one corner of this pixel on the scarcely distinguishable inhabitants of some other corner; how frequent their

misunderstandings, how eager they are to kill one another; how fervent their hatreds.

Our posturings, our imagined self-importance, the delusion that we have some privileged position in the universe, are challenged by this point of pale light. Our planet is a lonely speck in the great enveloping cosmic dark. In our obscurity, in all this vastness, there is no hint that help will come from elsewhere to save us from ourselves. . . .

There is perhaps no better demonstration of the folly of human conceits than this distant image of our tiny world. To me, it underscores our responsibility to deal more kindly with one another, and to preserve and cherish the pale blue dot, the only home we've ever known.

1995–96 Just weeks after his sixtieth birthday, Sagan was diagnosed with myelodysplasia, a rare bone marrow disease. On March 13, 1995, he took leave for treatment, and on April 7 he underwent a bone marrow transplant at Seattle's Fred Hutchinson Cancer Research Center. Word of his illness sparked an outpouring of well-wishes from around the world, including notes from Cornell colleagues, President Bill Clinton, a sixth-grade science class in New Mexico, and fans bearing chicken soup recipes. Sagan tried to respond to each one.

Sagan continued working feverishly, completing *The Demon-Haunted World: Science as a Candle in the Dark*. The book was a passionate defense of rationality against a rising tide of pseudo-science—and a prescient warning that the increasing power of science, combined with widespread ignorance about it, "is a prescription for disaster." Despite health setbacks and a new round of radiation treatments in the summer of 1996, Sagan expressed optimism about coming back to Cornell in October. *The Daily Sun* reported on November 11 that he was planning to teach Astronomy 202 in the spring.

On December 4, Sagan was interviewed on ABC's "Nightline" from his home in Ithaca. Host Ted Koppel, concerned by his guest's gaunt appearance, opened by inquiring about his health. Sagan replied: "I'm terrific. I've been very, very lucky and it looks like I'm out of the woods." Then: "We won't be sure for another year, a year and a half, but things couldn't look better." As time was running out on the seven-minute segment, Koppel asked for some final thoughts. Sagan smiled. "We live," he said, "on a hunk of rock and metal that circles a humdrum star that is one of 400 billion other stars that make up the Milky Way galaxy, which is one of billions of other galaxies. . . . That is a perspective on human life and our culture that's well worth pondering."

It would be Sagan's last message to a national audience. Within days of the "Nightline" interview, he contracted pneumonia and again returned to Seattle for treatment. This time, however, there would be no recovery. In the early morning hours of Friday, December 20, with his wife and collaborator Ann Druyan and other family members at his side, Sagan drew his last breath. One of his noted astronomical observations—"even the stars must die"—also served as a personal epitaph.

Carl Sagan was buried three days later at Lakeview Cemetery in Ithaca, in a hillside family plot protected by a copse of evergreens. A memorial was held on February 3, 1997, in Bailey Hall, a short walk across the parking lot from Sagan's old office in Space Sciences. Perhaps the most eloquent tribute was delivered by President Emeritus Frank Rhodes. Sagan, he said, "asked the big questions that others had given up. He confronted the painful issues that others sidestepped. He leapt over conventional boundaries by which others were constrained. Not for him was the pursuit of science an activity of a closed and inward-looking guild: for him, science was a means of public understanding and enlightenment."♦

About the Author:

Bill Sternberg '78 is deputy editorial page editor of *USA Today* and a member of the Cornell Alumni Magazine Committee. He took Sagan's Astronomy 102 class in Spring 1975 and interviewed him for the Daily Sun about the Viking landers' search for life on Mars.

NOTE FROM THE EDITOR

I would like to give a special thank you to author, Bill Sternberg and Jim Roberts, Editor & Publisher of *Cornell Alumni Magazine* for allowing us to reprint this article.

Please be sure to check out more content at the *Cornell Alumni Magazine* website:

www.cornellalumnimagazine.com

For any comments, questions or suggestions for future issues, please do not hesitate to email me at amcplanets@gmail.com

- Andrea Cosentino
Editor-in-Chief, PSF News

PSF Member Contributor

FORTY BILLION POTENTIALLY HABITABLE PLANETS
A Rebuttal

BY HERBERT WINDOLF

What we, as humans, consider "habitable" must mean habitability for oxygen-breathing, land-based animal life, not only microbial life.

A continuing question is how many planets may orbit the estimated 200 billion stars in the Milky Way Galaxy, and how many of those could support life as we know it? For scientists – but hardly for the general population – it is an important question whether or not life is common in the universe.

Our current level of observation of star systems, while impressive, is broadly confined to inference, statistics and guesswork. But more precise data are certain to become available in the future.

At present, we know of only one form of life, that found on Earth, based on the presence of water and carbon. The precursors of proteins based on these elements have been found in certain meteorites, but whether other elemental combinations exist to create a form of life remains unknown. We can only proceed by what we know and by its probability. Wishful thinking ought not let us be carried away by exaggerating probabilities – while also not underestimating them.

NASA's Kepler space telescope has identified about 150,000 stars in the constellation Cygnus – this in a miniscule field of the galaxy – of which 3,000 stars showed a temporary lessening of brightness from which the transit of a planetary body was inferred. The size of such transiting planets, whether of Earth-size or gas giant, is still approximate.

An independent study of 42,000 stars, similar to our Sun or slightly cooler and smaller, indicated over 600 potential planets, of which, however, only 10 were approximately Earth-size. Since only a fraction of planets, as seen from Earth, are orbiting their stars face-on, the team used statistics to determine that about 22 percent of all Sun-like stars have Earth-size planets in their habitable zone.

Based on these latest studies, NASA's Ames Research Center proposed that the Milky Way Galaxy is populated by "Forty Billion Potentially Habitable Planets," a report that was widely published by the media with plenty of hype, yet without critical evaluation of the probability. Again, humanity's wishful thinking of finding other life beyond ours in the universe ran amuck.

What is not considered in this estimate is that the galactic center, packed with radiation-emitting stars, is inimicable to life, while the outer regions of the galaxy are poor in heavier elements necessary for the accretion of planets and the rise of life. Approximately one-third of all star systems are binaries or multiple systems, whose gravitational complexity make stable orbits for planets minimal. The majority of stars are smaller than our Sun, being called M-type stars. Their habitable zone is therefore located farther inward. While these smaller stars have longer life times, any purported planets need orbit closer in, being in danger of becoming tidally locked, with one hemisphere always facing the sun, the other experiencing galactic cold, a situation not conducive for the development of life.

A G-type star's luminosity increases through its lifetime, making its habitable zone not only space-dependent but also temporary. A planet at one time within the habitable zone may eventually find its conditions for life diminished, and vice versa. And for life to develop takes time, several billions of years, first for ocean-dwelling life to produce oxygen, where it at first was protected from UV radiation. Once ocean-dwelling life has generated enough oxygen to bind the free iron, oxygen can be released into the atmosphere where it can generate ozone, protecting future land-based life from UV radiation. And a star only 1.5 times the size of our Sun will see its the habitable zone move more rapidly outward, leaving less time for the development of life.

So, let us address now in greater detail the probability for the rise of extraterrestrial life. Before entering into the gist of the matter, let's consider some side issues which, nevertheless, affect the rise and maintenance of life. If comets truly provided all of Earth's water, it may have also happened elsewhere. However, what if a water-world arose, which without the initiation of plate tectonics (because of small size, too small an iron core, insufficient radioactive elements to generate heat) remained a globe-spanning water world? Another inhibiting factor could be long-duration glaciations, or even "snowball" episodes whereby the entire planet became covered by ice sheets.

Finally, here is a listing of conditions required to coalesce for habitability – beyond the mere

extrapolation of the number of star systems with planets.

R = low Radiation environment. We can likely exclude the great number of stars located in and around the galactic core, inimical to life.

G = G-type star

B = Binary or multiple star systems make up approx. 1/3 of all stars. Their gravitational pull makes planetary orbits rare or unstable

C = Carbon and other elements required for life in a system's composition, provided by dust clouds, novae, etc.

I = Iron-nickel core for development of magnetosphere, protecting life from radiation.

S = Size of planet, not too small, not to big in exerting its gravity on potential life forms.

V = Volcanism and plate tectonics to generate a first primitive atmosphere.

D = Distance from star to be within the Goldilocks' zone where water remains liquid.

T = axial Tilt. If too great, seasons would be extreme.

O = circular Orbit. An orbit carrying the planet outside the Goldilock's zone would result in periodic, severe glaciation

P = regular Planetary system, as found in ours as opposed to most, at this time inferred extraterrestrial systems that are often hugely chaotic.

J = no Jupiter-size giant nearby which would exert gravitational influence and disturb the putative planet's orbit and axial tilt over time

M = a substantial Moon to stabilize the axial tilt of the parent planet.

If Earth's Moon was truly created by the early impact of a Mars-size body, the question arises how often such an event would take place in the galaxy at the proper time?

In 1961 Dr. Frank Drake suggested a formula by which he attempted to calculate the probability for extraterrestrial intelligent civilizations by entering assumed values for his various parameters.

Here is another formula which uses the above parameters 1-13 to guess the probability of finding habitable planets:

H = R x G x B x C x I x S x V x D x T x O x P x J x M

H = .5 x .5 x .1 x .8 x .6 x .8 x .5 x .8 x .9 x .5 x .2 x .6 x .1 = 0.000020736

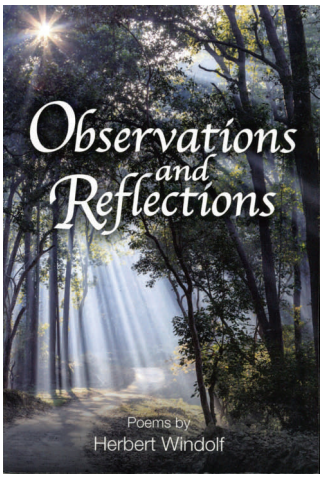
which, multiplied by the putative 40 billion means, maybe, 830,000 habitable planets.

From it we may conclude the unlikelihood of finding life or animal-habitable planets in our neighborhood, much less that ET will contact us. So much for the all-too-casual claim that the Milky Way Galaxy harbors up to 40 billion potentially habitable planets. There could be a lot of them, but perhaps 40,000 times less than claimed!

For additional information see the book "Rare Earth" by Peter D. Ward and Donald Brownlee.♦

Observations and Reflections

Poems by Herbert Windolf



This book of poems was written in the course of more than 50 years, separated by a hiatus of 30 years that were dedicated to commercial enterprises. The poems comprise some of Herb's insights through this span and conclude with his poem entitled "Testament":

To come to the end:
This is where I stand!
With all that I've missed,
Mistook and beheld…

All his poems are accompanied by aphorisms or quotes. A friend, John Haupt, said after reading a collection of his poems: "I am glad I read them slowly, perhaps one poem every evening. Some are so powerful and profound they sometimes affected my dreams."

Questions, comments or to purchase Herb's book, please contact him directly at hwindolf@cableone.net. The book can also be found on Amazon.

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