

UPDATE ON THE DEVELOPMENT OF A NEAR EARTH OBJECT OBSERVATORY AND ITS ROLE IN EDUCATION

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Abstract

Two years ago at the Space Studies Institute Princeton Conference on Space Manufacturing (The High Frontier Conference XIV) I presented the paper *On The Development of a Near Earth Object Observatory and Its Role In Education*.¹ In the two years since that presentation much has happened. This presentation is an update on the development and the dedication of the Sir Arthur C. Clarke Near Earth Object Observatory as a prototype and training Near Earth Object (NEO) observatory and the progress of the Near Earth Object Foundation. Lessons learned in this ongoing adventure will be shared. The present activities and future plans of the Near Earth Object (NEO) Foundation and the NEO Team members will be outlined in a chronological manner. The next NEO observatory in the proposed series will be the Gerard K. O'Neill Educational NEO Observatory.

Introduction

To keep from giving the reader a great deal of redundant information from my first paper, I have decided to change the style of presentation from a narrative script to a chronological sequence of major events so that the reader may more easily watch the evolution of ideas and events as the NEO Foundation finds its feet.

Since the presentation of the genesis of the Near Earth Object (NEO) Foundation at The High Frontier Conference XIV, May 1999, several important and interesting events have occurred in the growth of the NEO Foundation. First and foremost, the Near Earth Object Foundation is now an incorporated, non-profit foundation with the purpose of conducting Near Earth Object (NEO) searches, detection, and characterization, promoting scientific and astronomical research, and promoting astronomical education.

The Near Earth Object Foundation has constructed a prototype / training NEO observatory, with a computer driven Meade LX200 12" Schmidt-

Cassegrain telescope with a Pictor 216XT CCD camera and autoguider / imager, a wide array of ancillary equipment, a Technical Innovations Home Dome HD-6T, and adjacent converted garage as the observatory control room and meeting area. This observatory complex was dedicated on December 16, 2000 as the Sir Arthur C. Clarke Near Earth Object Observatory. The highlight of the dedication ceremony involved a personal "video" greeting by Sir Arthur C. Clarke from Sri Lanka celebrating his NEO Observatory namesake and his 83rd birthday.

The Near Earth Object Foundation has additionally begun the initial process of creating a second and larger permanent NEO Observatory, to be dedicated as the Gerard K. O'Neill Educational Near Earth Object Observatory. After researching and discussing several local sites for locating the O'Neill Educational NEO Observatory, we have found a potential site at a nearby park, Grand Vue. As the name implies, this is the perfect local site for a full fledged NEO observatory having educational outreach considerations. The Board of Directors for Grand Vue Park have shown a strong interest in partnering with the NEO Foundation to provide space for the O'Neill Educational NEO Observatory and to help promote and participate with the educational aspects of the NEO Foundation's mission. In this direction, the NEO Team members are currently in negotiations for a 21.5" telescope and 20' observatory building to be moved to the Grand Vue Park site. The generous contributions of the interested members of the Space Studies Institute will leverage this effort to make the Gerard K. O'Neill Educational NEO Observatory a reality.

Other projects that the NEO Foundation is currently investigating include non-optical NEO detection, local archeoastronomy, development of the West Virginia Meteor Observatory, and optical SETI. The full paper will report on the current development of the third NEO Foundation Observatory slated to be housed on the big island of Hawaii, alliance with NASA/SETI's Meteor Scatter Program, and educational programs for teachers and students at the Sir Arthur C. Clarke Near Earth Object Observatory

and via the Internet and West Liberty State College's ATM distance learning Laboratory.

To make this all possible, several of the local area amateur astronomers (the NEO Team) that have formed the NEO Foundation have weekly meetings to keep the proverbial balls in the air of this multi-leveled juggling game of creating a series of NEO Observatories in line with the directive of the *k-SkyWatch Survey*. The NEO Team will continue to troubleshoot, fine tune, and learn from our prototype / training NEO observatory and by the time this presentation is made in early May 2001, a regular observing schedule will be enacted. NEO detection and reporting methods and the integration of educational activities for students and teachers will be at the prime focus for the NEO Foundation and members of the NEO Team in the near future. These learning experiences will be invaluable when planning for and constructing the next in a series of NEO Foundation Observatories.

k-SkyWatch Survey

The idea of the Earth being impacted by an asteroid or comet nuclei has been at the forefront of my thoughts since my early childhood. Looking at the Earth's Moon with any moderate magnification tells of its violent past - a past that the Earth must also have shared. Extrapolating this violent past to the present offers even the casual observer to consider the dire consequences of such an event ever happening during our lifetimes. In reading Arthur C. Clarke's science fiction classic Rendezvous With Rama² as an adolescent in 1974, the concept of a Clarke's "Space Guard Survey" galvanized me. Here was a method of defining the threat so that it could be mitigated. A decade later this idea began to evolve itself into the *k-SkyWatch Survey*. The *k-SkyWatch Survey* is an organized search for and characterization of the orbits of all possible threatening bodies in the solar system. These possible threatening bodies range in size from only a few meters in diameter (the Earth's atmosphere acts as an effective shield for anything smaller) to many kilometers in diameter.

To be effective the *k-SkyWatch Survey*, once started, cannot be turned off. Asteroids, short period comets and long period comets do not remain forever in the same nice, neat orbits. These bodies are constantly given varying gravitational tugs and pulls by all of the masses in the solar system creating a chaotic orbital path not easily defined for long range forecast. The *k-SkyWatch Survey* proposes that the sky be constantly surveyed by 1,000 (*k*) autonomous telescopes placed around the globe of the Earth. Twelve sites are proposed, six in the southern

hemisphere and six in the northern hemisphere. Each of these twelve sites would contain twelve "pods" of telescopes. Each pod would have a hexagonal centered array of seven telescopes. The telescopes in a pod or in the whole site could observe the sky by acting separately to cover more sky, by overlap observing in groups to look for fainter objects. Of course piggy-backed science would occur from the data streams. As humans venture out into the solar system this need for a *k-SkyWatch Survey* will follow, to insure the survival of the human species on Earth and elsewhere in the solar system. At first, in my naive early 20's, I imagined the world governments building such a *k-SkyWatch Survey* array. Now a little older, a little wiser, and much more cynical, I envision a dedicated grassroots group of concerned individuals in charge of insuring the survival of the human species. A global NEO defense is just not something I feel can be left up to elected government officials.

The Near Earth Object Foundation

The *k-SkyWatch Survey*, if it is to be grassroots and grow to meet the need stated above as a global NEO defense agency created for insuring the survival of the human species, needed to start somewhere.

I am convinced that if the governments of the world were truly capable of creating such an agency as the *k-SkyWatch Survey*, they would have done so in the months following the week long bombardment of the planet Jupiter by the fragmented Comet Shoemaker / Levy 9. As the world watched, Jupiter was repeatedly hammered July 16-22, 1994. Each of the large impacts we witnessed could have had catastrophic civilization, climatic, and species altering effects if it had been the Earth and not Jupiter to have been the site of these impacts. And yet, after all this time very little has been done. The sudden flurry of governmental lipservice we have seen in the last few years, is I fear just that.

So with the help of a few close friends with same concerns we started having weekly meetings as the Near Earth Object Foundation to start the ground work for the *k-SkyWatch Survey*. On the evening of November 17, 1998 in the Exhibit Hall of the West Liberty State College SMART-Center (a hands-on science center, Science Mathematics And Research Technology, where I serve as the director) we officially had our first meeting to carve into the unknown, insure the survival of the human species, and begin the adventure of the *k-SkyWatch Survey*.

The First Few Months

Those people that attended that first meeting were to remain the core of the NEO Foundation.

Collectively this core of people is the NEO Team. The members of the NEO Team that attended the first meeting were: Russell Stackpole, Joe Zoc, Joe Moskitis, and myself. Unable to attend due to living in Honolulu, Hawaii, was Ted Brattstrom.

At that first meeting we discussed the threat of NEOs and discussed the equipment we thought was necessary and available as off-the-shelf items that we would need to perform NEO searches, search techniques, NEO observatory site requirements, available software, and how much money this would realistically take to start the first NEO observatory as a prototype / training facility. Our list of tasks to start up and the needs of resources and materials grew at each weekly meeting. Soon these weekly meetings at 6:30 p.m. became known as *Tuesday NEO Night*. Early on we discussed the idea of what we call the management philosophy of the NEO Team "concurrent incremental progress" (CIP). CIP works like this, if Step A must be started and completed before Step B is taken, and Step B must be started and completed before Step C is considered or taken, etc.... Any road blocks or speed bumps we encounter in our quest for the realization of the *k-SkyWatch Survey* would essentially stop all forward progress. Therefore we adopted CIP. Using the philosophy of CIP in our efforts allows that each of the NEO Team members individually or in smaller teams attack all parts of the problem of getting the *k-SkyWatch Survey* up and started at the same time. This concurrency approach to the many facets of the *k-SkyWatch Survey* keeps our Tuesday NEO Nights always showing forward progress toward our goals. This allows our spirits to not dampen during times of setback and lack of funds. This forward progress is what keeps us going for every week we see forward progress in at least several directions.

Also adopted during that first meeting was the idea to put the agenda for each NEO Team meeting on an easel holding a large pad of paper. I serve as moderator and facilitator for the NEO Team meetings and record all ideas on the single pad paper sheet reserved for that night's discussion. This allows everyone to see what went on during the week before, keeps an agreed upon record of the activities and decisions, allows easy visibility for that week's progress and goals, and lets us all see what areas we need to concentrate on next.

Out of these first months of NEO Team meetings came our logo, mission statement, goals, needs and good idea of how to reach our goals, needs, and the fulfillment of our mission statement.

By mid January 1999, we added two new members to the NEO Team. Luke Kosar and Jimmy Perry were interested local high school students that

wanted to join the NEO search effort. Additionally, during those first few months we decided to become a non-profit corporation. We were elated when we received permission from Arthur C. Clarke to name our prototype / training NEO observatory after him.

Mid February 1999

By creative / legal fiscal-slight-of-hand described in more detail in my 1999 SSI paper³, I was able to secure some modest salaries for the core members of the NEO Team, and used my larger "manager" salary to purchase a Meade LX200 12" Schmidt-Cassegrain telescope, a Pictor 216XT CCD camera and autoguider / imager, necessary software for guiding the telescope and image processing software for asteroid location, and wide array of ancillary equipment we thought essential to get our NEO feet wet. We had some leads on a few potential observatory sites and were looking at dome options and were considering presenting what we had accomplished thus far to the 1999 Space Studies Institute (SSI) Conference in Princeton, N.J. in May.

Mid May 1999

We now had several designs for domes and dome platforms researched and the presentation to SSI was behind us. We felt that our SSI presentation was well received by the kind folks at the conference. This gave us the fuel we needed. We were definitely on the right track. My wife (Libby) and I moved to a circa 1910 Victorian house only two blocks from the SMART-Center where we both worked. There were many good reasons for the move. Two of my favorites were the relatively flat backyard just right for our first NEO observatory and a two car garage Libby said I could have as the future NEO Foundation HQ and observatory control room.

Summer of 1999

As the summer of 1999 approached the NEO Team was making the final NEO observatory dome choice. The NEO Team decided that we needed a white dome to look like we were a real observatory. The size of the observatory did not really matter. The shape and color seemed to be what registered in everyone's mind as an Observatory. We selected the Robo-Dome from Technical Innovations⁴ costing about \$2,700.00. Libby had no real major problem with that amount of money, knowing that it was so important to me and the NEO Foundation. The Robo-Dome seemed just perfect for what we wanted to do. The Robo-Dome is a small completely robotic dome that would house the Meade LX200 12". The only problem was

where to get the \$2,700.00 and extra money for shipping, installation, and the unseen extra costs always associated with first time purchases. We were looking at a minimum of \$3,000.00 to get the Robo-Dome up and running, most likely the final amount would be something like \$3,500.00

Upon inquiring about the ordering the Robo-Dome, a problem arose. Meg and John Menke (the owners of Technical Innovations) called me and asked me to precisely measure the dimensions of the Meade LX200 12" scope. John was concerned that the fit might be a little too snug to accommodate the LX200 12" scope and have enough room to not do any damage to the scope or Robo-Dome. It turned out that we were close, too close for comfort, according to John. What to do? A larger dome would work. The next size up was a six foot Home-Dome for another several hundred dollars more than the Robo-Dome. And if you were going one size up, why not get the deluxe six foot Home-Dome HD-6T? Problem was the HD-6T cost an additional \$1,000.00 on top of the already \$2,700.00 for the Robo-Dome, plus we were now scaling up all installation expenses! The HD-6T needed a 8' by 8' platform. Libby noticed that I was pretty upset when the realization of the situation started to set in for me. She asked me what was wrong and half way through my explanation of our situation interrupted me and said "So the problem is we need only \$4,500.00 for our dome. That means we sort of watch our spending and figure out where to get this \$4,500.00". She was serious. Problem was we just bought a house, and we did not have any extra money. We brainstormed and decided that if I were to get paid for the three weeks of Summer SMART Institutes (summer enrichment programs for area youth highly interested in science and math) planned for the summer, by coming to work but taking vacation days while I was there, I could pay myself just enough to cover the additional expense of the HD-6T.

But now a new dread loomed. I had checked with the City Building of Wheeling, WV and asked about the zoning and building permits for putting in the Robo-Dome. The Robo-Dome was just under the minimum size limit to fall under either the zoning laws or the need for a building permit. The Robo-Dome was deemed a dog house class structure to the city of Wheeling. The HD-6T however was considered an additional building on the property and required that we meet all of the inspections, permits, and zoning requirements to get permission to put in the HD-6T. An additional headache was now created. The Robo-Dome could be nearly self contained. The HD-6T would need a platform or a concrete slab base - extra time, extra work, extra money, and extra inspections,

permits, paper work, and zoning to overcome. Add to this the decision of using the tripod the LX200 12" came with or installing a pier in the ground.

July 1999

Amidst the new, unexpected dome construction directions, decisions, setbacks, the extra time and money, and paperwork, the real fun began in the form of filing for the incorporation of the Near Earth Object Foundation and the paperwork for a 501-c-3 (non-profit) status. I was low on funds and we spent many weekly meetings shaking our heads at the legalese and trying to make sense of the requirements to even fill out the request forms. Somewhere in all that I presented another paper and represented WLSC and the NEO Foundation at the second Mars Society Conference in Boulder, CO in the hopes of making more contacts in the NEO field and getting the NEO word out. When I came back some of the NEO Team had helped out with a StarWatch with the local astronomy club that we are members of at Grand Vue Park just south of Wheeling. Grand Vue Park liked the turnout of people for an educational event and asked to start a dialogue about considering our next NEO observatory site to be on the top of a beautiful clear knoll in the Park.

August 1999

The NEO Foundation secured the domain name www.neofoundation.org Bettie Greber from SSI phoned and asked how SSI could help the NEO Foundation with its work of NEO discovery and orbital determinations. During our conversation I mentioned the developments at Grand Vue Park. Bettie asked if we had decided on a name for our second NEO observatory and suggested the visionary founder of SSI, Gerard K. O'Neill. I liked the idea and asked the rest of the NEO Team what they thought about the idea of the Grand Vue Site being named the Gerard K. O'Neill Educational NEO Observatory. All agreed.

September 1999

The Board of Directors of Grand Vue Park meet with the NEO Team formally to look at the idea of starting a partnership.

October 1999

Our biggest stumbling block was getting the money for the HD-6T from my working during vacation days for Summer SMART Institutes was being held up. The state of WV did not like the fact that I was being paid extra as a 12 month employee. After much calm discussion the state of WV cut me the

check. The problem now was it was nearing winter in WV. This was not the time to be out digging holes, putting up a dome platform, and assembling a HD-6T Home -Dome kit.

November 1999

A new problem arose or would arise when the HD-6T crate arrived. The HD-6T was paid for, but I was told by the shippers that I needed a four foot high loading dock at my house to receive the crate. I had only a few days to tell them the delivery address for shipping the crate. Robb True Value Hardware, not far from my house, came to my rescue and offered to help. The owner, Brian, called the shippers, had his staff uncrate the dome parts, load these on a delivery truck, drove them to my house, and had the parts gently placed in my garage. Brian laughed when I asked him what I owed him. Brian said it was his good neighbor policy - wow, I'll say! We made Robb True Value a partner with the NEO Foundation.

December 1999



Luke Kosar inspects dome site in the frost

The NEO Team continued to meet and gather data and expertise on the equipment and techniques. We waited for the ground to thaw long enough to start the post holes. We were still working on the platform design that would satisfy the Wheeling Building inspector and work for our needs. SSI put out a request for members to donate money to their sponsored NEO observatory - us! We were thrilled at the attention and regarded this as an unexpected milestone in our evolution. Our efforts were being recognized. But the end of 1999 the NEO Foundation had received \$600.00. The money was received and kept for us by another partner, West Liberty State College.

An unseasonal warm spell thawed the ground just long enough for us to break ground for the Arthur

C. Clarke NEO Observatory dome platform on December 19, 1999. Joe Moskitis, Sr. was instrumental as an experienced carpenter in getting us started in the right direction. His experience and advice from selecting lumber to final construction was much appreciated.

January 2000

I have been working on a Masters degree in Space Studies via the University of North Dakotas distance masters program ⁵. I registered for the SpSt 425, Observational Astronomy course taught by Dr. Chuck Wood. Chuck Wood was the dean of the UND Space Studies Department and an avid Lunar researcher. SpSt 425 was to be the first ever Internet class using a remote telescope as the basis for research. The UND telescope, the Asteroid and Comet Internet Telescope (ACIT) would be our introduction to robotic telescopes and remote operating of telescopes and software. The class was experimental, and we all thrilled to be the lab rats to test the software and concepts on. The NEO Team and I saw this as an invaluable hands-on experience and opportunity to test some of our ideas and watch the coordination of observing time with the other students in the class.

The city of Wheeling Building Inspector, who liked what we were doing, inspected our four post holes and declared them to be "adequate holes for the job" and agreed to the dome platform plans we submitted. After a bit of a search for any reasons why a Wheeling residence could not be zoned for an observatory, my backyard was officially "observatory zoned", and we could proceed with our plans.

February 2000

At the beginning of February 2000, members of SSI had sent us a total of \$1,400.00 in donations. We agreed that this and future monies from SSI members would be spent on the Gerard K. O'Neill Educational NEO Observatory. The SpSt 425 ACIT had a few bugs that were being worked out. One thing none of us had seriously considered was the necessity of an auto focuser for our NEO telescope when operated remotely.

March 2000

SSI prepares to republish the original paper I presented to SSI in May 1999 in an upcoming SSI News Letter to stimulate SSI members to donate to the Gerard K. O'Neill Educational NEO Observatory. The NEO Team investigated several educational granting agencies for potential funding to utilize the Arthur C. Clarke NEO Observatory in teacher workshops.

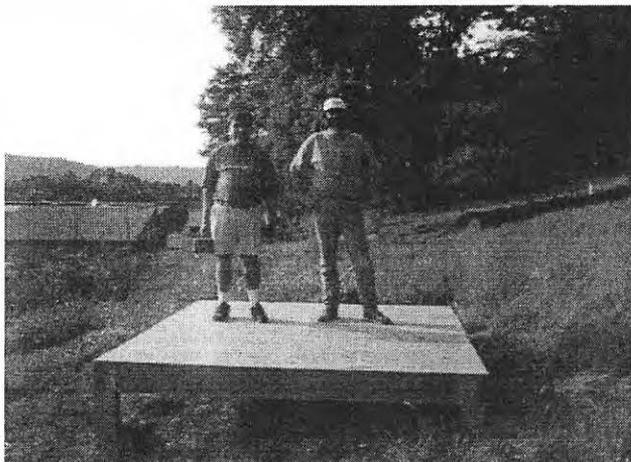
April 2000

The NEO Foundation Certificate of Incorporation arrives, and work continues on applying for 501-c-3. UND class SpSt 425 is now working on image processing with various software. I decided to present a paper at the Lunar Development Conference in July to network more and learn more. The NEO Team recruits newest member, Richard Pollack. Richard's vast and broad experience base and interests adds a new flavor to the Tuesday NEO Nights.

May 2000

NEO Foundation joins the local area astronomy club ASTROLABE and WLSC SMART-Center in celebrating National Astronomy Day. NEO Team decides on the date of the dedication of the Arthur C. Clarke NEO Observatory. The date will be December 16, 2000 - this is Arthur C. Clarke's 83rd birthday. The UND class SpSt 425 Observational Astronomy concludes - lots of lessons learned and a very valuable experience. Additionally, for Dr. Wood's SpSt 425 class all students were required to create a web page housing some of their images and experiments with the ACIT⁶.

June 2000



Joe Moskitis and author on platform

Ted Brattstrom announces his plans to move to the big island of Hawaii. Ted will start looking for our third NEO Observatory site close enough for him to supervise its operations. Site considerations are light pollution, proximity to Ted, altitude of site, and land costs.

Work continues on construction of the dome and platform. Note: weekends are the only time the NEO Team has available to work on these projects. A

sense of ownership must accompany the dome and platform for the NEO Team members to "own" them.

I was accepted to present at the Lunar Development conference. The last of June sees the dome platform complete. The treated lumber needs to "dry out" before the paint and sealer is applied.

July 2000

The dome platform receives finishing touches. NEO Team members start to remodel the garage. Painting is started, new wiring and lights, and a total electrical make-over is needed. I present paper at the Lunar Development Conference. Paper was well received. I keep seeing familiar faces at these conferences.

August 2000

The donations from members of SSI now topped \$3,300.00. The NEO Team members are looking at what needs to be done to the Grand Vue Park site to ready it for the second NEO Observatory. I attended and presented a paper at the third Mars Society Conference. My presentation was well received by the audience - lots of comments. Again many more familiar faces. It looks like I have entered a cycle of presentations and conferences thanks to SSI.

Richard Pollack puts a template of our neofoundation.org web site up on his web site to view. We make a few suggestions. Overall the web site looks great. The NEO Team members continue with the plans and preparations for the dedication of the Arthur C. Clarke NEO Observatory in December.

September 2000

Our web site www.neofoundation.org is up and functional. Richard, our web master, is making constant improvements to make the site richer. The WLSC SMART-Center and the NEO Foundation partner to write an educational grant for a summer 2001 teacher workshop in astronomy. The name of the grant proposal is "2001: a Space Odyssey for K-6". The grant will utilize the Arthur C. Clarke NEO Observatory facility and the members of the NEO Team. This will allow the NEO Team to begin working directly with teachers and students in our local area. Work on the Dome and garage / control room continues.

Bell Atlantic / Verizon considers the installation of a high speed ATM data link for the WLSC SMART-Center. This high speed ATM link could access the Arthur C. Clarke NEO Observatory to deliver a live telescope image feed over the ATM

network free for any school linked to the ATM system in WV.

October 2000

The Board of Directors of Grand Vue Park furthers the formal talks of partnering and collaboration with the NEO Foundation concerning the Gerard K. O'Neill Educational Near Earth Object Observatory.

We find out that Arthur C. Clarke is now Sir Arthur, and may be able to be a virtual part of the dedication ceremony and his 83rd birthday party via a video tape, if we can convert his PAL VHS format to our NTSC VHS format and get it from Sri Lanka (another separate story).

Work continues on the guest list and preparations for the dedication of the Sir Arthur C. Clarke NEO Observatory. The NEO Team assists with a StarWatch for over 200 persons at an elementary school in Weirton, WV. Joe Moskitis concludes the dome platform by installing steps. Dome construction continues.



Left to right: Russ Stackpole, Joe Zoc, and author with nearly completed HD-6T dome on platform

November 2000

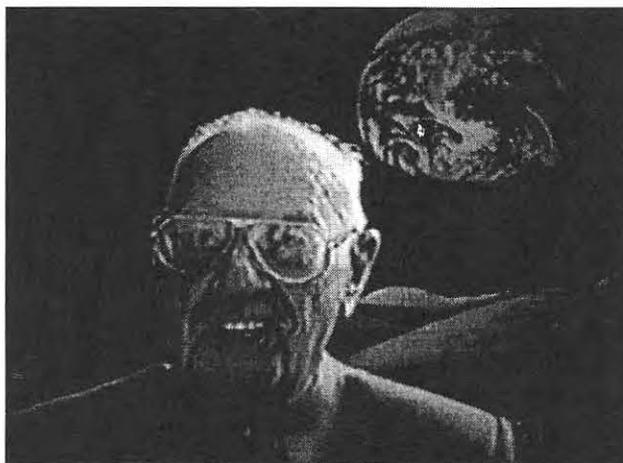
Painting is completed and the first phase of rewiring of the control room / meeting area is accomplished. Furnishings are brought in. Work on the HD-6T continues. Plans for the actual dedication of the Sir Arthur C. Clarke NEO Observatory are finalized. A tent, folding chairs, and punch bowl is rented for the dedication (from Robb True Value at a considerable partner discount). Wireless microphone and receiver, mixer and speakers, video player and monitor, podium, folding tables and all of the dedication needs are double checked.

December 2000

Sir Arthur C. Clarke Near Earth Object Observatory is made ready for dedication. Program fliers for the dedication completed. Finishing touches for the control room are completed. Food appropriate for the occasion is bought and prepared. RSVP guest list checked for food and space requirements.

December 16, 2000

Dedication of the Sir Arthur C. Clarke Near Earth Object Observatory takes place at 2:00 p.m. EST on a cold rainy day with nearly 50 people in attendance. Local newspaper and television cover the event. Cecil Gwinn, retired mathematical physicist and life-long science fiction buff, gave the opening remarks, followed by an eight minute video (converted) from PAL VHS format (another story in itself) greeting from Sir Arthur from his studio in Sri Lanka. Sir Arthur read his first, short, introductory chapter from his book Rendezvous With Rama and discussed the NEO threat. I gave a progress report and acknowledgments to those in attendance. The reception followed with food and drinks with space related names, such as "comet cookies" and "Jupiter Juice".



Sir Arthur C. Clarke from Sri Lanka

January 2001

First light for the Meade LX200 12" takes place on the evening of January 1, 2001, the 200th anniversary of the discovery of the first asteroid Ceres by G. Piazzi. The first official Tuesday NEO Night meetings are held in the new control room. A possible 21.5" telescope is discovered for sale in Flatwoods, WV. Future equipment needs are discussed.

February 2001

Memorandums of understanding between WLSC and Grand Vue Park and the NEO Foundation are drafted. A letter of inquiry for the 21.5" telescope is sent. The NEO Foundation now has \$6,400.00 in donations from members of SSI to leverage the start of the Gerard K. O'Neill Educational Near Earth Object Observatory. Discussions of the upcoming SSI 2001 Conference for presentations start. Considerations to join ProSpace's March Storm - space lobbying effort to inform elected officials on Capital Hill in Washington, D.C. about the needs of the people concerning space is discussed. More concrete discussions about future sponsored directions for the NEO Foundation and the NEO Observatories occur. Optical SETI and non-optical means to detect NEOs and the creation of the WV Meteor Observatory as a possible alliance with NASA/SETI's Meteor Scatter Program are now center stage. The idea of a *Near Earth Day* celebration to coincide with Earth Day as a public awareness for NEOs was discussed.

March 2001

The NEO Team members worked on ideas for the SSI 2001 Conference presentation. I started working on a paper for the current UND class SpSt 541, Management of Space Enterprises, professor, Dr. Stephen B. Johnson. I am taking this class is to learn how to better manage the NEO Foundation and develop a good management plan for the NEO Foundation. I attend the ProSpace⁷ March Storm activities in Washington.

April 2001

This brings us to the present time of this writing. I am at present working on two papers with the assistance of the NEO Team members and am considering attending the Lunar Development Conference again this July, 2001. Several other possible conferences loom on the horizon. The first Near Earth Day 2001 will be sponsored by the NEO Foundation⁸ on Earth Day 2001, April 22, 2001. Requests have been made to three very deserving individuals to name the next three NEO observatories after. The 21.5" telescope and the 20 foot dome it comes with we found were dismantled in 1978 and have not been used since. The 20 foot dome is alas, a loss due to weathering. The costs of refurbishing the 21.5" scope and putting it in service for NEO work would be more than the cost of buying two motorized 16" telescopes complete with CCD cameras, computers for control and image acquisition and storage. The combined light gathering potential of these two 16"

scopes would exceed that of the 21.5" scope by almost 11%. At long last, it is now possible with off-the-shelf equipment and software to combine the light gathering ability of two or more telescopes using CCD cameras and computers. The NEO Team members are reviewing my original 1985 *k-SkyWatch Survey* proposal notes for multiple telescope interfacing resulting in a single large aperture telescope in the light of present day affordable resources. The idea of interfacing the CCD camera signals of seven 16" telescopes (one pod) to create one image seems possible and doable for present amateur astronomers. Seven telescopes, seven CCD cameras, and seven individual computers to run and serve as image collectors and mergers, and a facility to house all this in is now, we believe, in the price range of a luxury car. The effective light gathering ability of a pod of seven 16" scopes exceed that of a single telescope having a mirror diameter of just over a meter. Time will tell how well this method will work. Perhaps at the SSI 2003 Conference I will present another paper as to the effectiveness of this method.

I wish to take this time to express my gratitude to Betty Greber, who convinced me to not only attend the SSI 1999 Conference, but she insisted that I must present a paper. Where the NEO Foundation is today in its direction and development is largely due to that first SSI 1999 Conference. That experience and the introductions and friends I have made have for me, the members of the NEO Team, and the NEO Foundation been invaluable. To find others that feel the way that we do, with the same passion, clarifies and reinforces our belief in what we are doing. Thanks.

References

- 1 Robert E. Strong, *On The Development of a Near Earth Object Observatory and Its Role In Education*, Space Manufacturing, Proceedings of the Fourteenth Space Studies Institute / Princeton Conference on Space Manufacturing (The High Frontier Conference XIV), pages 76-79, (1999)
- 2 Arthur C. Clarke, *Rendezvous With Rama*, Harcourt Brace Jovanovich, Inc., New York (1973)
- 3 Robert E. Strong, *On The Development of a Near Earth Object Observatory and Its Role In Education*, Space Manufacturing, Proceedings of the Fourteenth Space Studies Institute / Princeton Conference on Space Manufacturing (The High Frontier Conference XIV), pages 76-79, (1999)
- 4 <http://www.homedome.com>
- 5 <http://www.space.edu>
- 6 <http://www.spst425site.cjb.net>
- 7 <http://www.prospace.org>
- 8 <http://neofoundation.org/nearearthday.htm>