# December 2017

#### **SRI International**

# **Alumni Association**



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# **MESSAGE FROM ARCHIVES CHAIRMAN DON NIELSON**



Don Nielson

As we close out another year, I trust you can look back on yours with some satisfaction, whether from accomplishments, the freedom retirement has offered, or just good health. This issue of your newsletter has some interesting articles, with topics ranging from how SRI's Pat Henry and his team dealt so intelligently with analyzing

the world energy system and forecasting the impact of the oil crisis of the mid-1970s to Murray Baron's personal involvement in the high-altitude nuclear bomb tests of 1962. I hope you will take the time to savor them.

October saw the holding of our annual reunion, and although we'd like to have seen a few more of you there, it was fairly well attended, and I believe everyone who came left filled. For those who couldn't make it, we cover some of it here, including some pictures.

But as part of this introduction, we must reflect on two associates who have just left us. One is Boyd Fair, who contributed so much to this Association. The other is Bill Miller, SRI's president from 1979 to 1990. Their obituaries are in this issue.

When George Abrahamson, the person behind the genesis of the SRI Alumni Association, was no longer able to lead it, he asked for someone who could take his place and keep the momentum he had created. I remember suggesting Boyd Fair as someone I knew who was both the epitome of responsibility and organizational talent and one who just might take it on. Boyd accepted George's request, but just as an interim leader. What happened then reflected so much on Boyd's character and what he was willing to give. He led the Steering Committee, synonymous with leading the association, from 2004 until 2011 and did it willingly and effectively. He also took on the job of adding our web interface—that is, what you see regarding the Alumni Association as you visit the SRI site, including all these newsletters. This organization owes so much to him. A well-attended celebration of his life was held at SRI on November 8th.

William F. Miller came to SRI after being Stanford's Provost, or chief academic administrator. The first of two important aspects of his tenure at SRI that I recall was leading the institute more directly and diligently into profiting from its inventions. Bringing that intellectual property into the licensing and equity marketplace was an initiative that has gained importance and borne a lot of fruit. The second event was persuading General Electric to gift to SRI its David Sarnoff Research Center in Princeton, New Jersey. It is now an integral part of SRI.

Finally, another former head of our association was among those who lost everything in the recent Northern California fires. Tom Anyos and his wife, like many others, were notified in the middle of the night that they had to leave their home at once. We are relieved that they are safe, but that home, which they had lived in for only a few years, was totally destroyed. Although insurance will be adequate to help in their recovery, a lifetime of treasures is gone.

# The 2017 Alumni Annual Reunion

#### By Donald Nielson

This year's reunion was held on the 5th of October in the SRI International Building. As previously, it began with an hour or more of hors d'oeuvres and socializing—reacquainting with friends and the enjoyment of meeting not a few people for the first time. Curiously, interdepartmental (read interdisciplinary) interaction is never so easy as at our reunions! Given all those we want to interact with, it seems to go entirely too fast. The presentations follow, and then there is the return to the foyer for trying to complete your cycle of friends amid dipping in the now traditional and salubrious chocolate fountain. Everyone then heads out with plenty of misdirected chocolate as evidence.

As usual, the presentation portion of the reunion involved three parts: first, a talk by someone familiar with the institute and its current operation; then the Alumni Hall of Fame awards; and finally a drawing for some gifts, courtesy of the SRI Credit Union and SRI Human Resources.

#### **SRI Today**



The SRI leader who gave us an update on SRI was Peter Marcotullio, and I'd venture that everyone there learned something new about how SRI now operates. Peter is SRI's Vice President of Commercial R&D Development, a role that didn't exist during most of

our tenures. As such, he is responsible for increasing SRI's contract diversity by developing long-term relationships with corporations. This is sometimes catalyzed through the use of SRI's intellectual property. Broad use of this property ownership occurs not just in business development but in licensing and gaining equity positions as well. SRI's current CEO, Bill Jeffrey, is fond of relating how much more is spent on R&D in the private sector than by government and is therefore trying to make commercial sponsorship a critical part of SRI's business model.

Since Peter's domain spans the institute, he is broadly aware of its day-to-day operations and in a perfect position to give us a very informative picture of SRI today. If you are curious about this relatively new aspect of SRI, you can visit most of his presentation at https://www.sri.com/sites/default/files/ brochures/sri\_overview\_for\_alumni2017.pdf.

#### Hall of Fame Recipients

This year, there were four inductees, three of whom were present to receive their honor. Two awards were for research in the area of education, Mary Wagner and Barbara Means, and two were from the area of the institute known for years as the Poulter Laboratory, Jim Colton and Don Curran.



Jim Colton, Mary Wagner, and Barbara Means.

Because SRI was a child of Stanford University, you might expect research in education to have appeared early in its agenda. In fact, that was true with such projects on the books as early as 1953. But this year's awardees in education research began their contributions during the mid-1970s and mid-1980s and continued in their chosen areas until very recently.



*Dr. Mary Wagner* focused on children with special needs in her educational research. Of course, such children are found throughout our educational system, and over time a range of different approaches have been taken to meet their needs. The question naturally arises as to which of those approaches are most

effective, and finding the answer to that question involves longitudinal studies about how the children fare, with some information gathering extending even beyond their school years. Mary led SRI through years of this kind of evaluation, sometimes tracking as many as 8,000 children. The importance and competence of her work led her to testify twice before Congress. As one might expect from Congress, such critical but multidimensional educational studies tend to get their outcomes spun to politicians' whims. In talking with Mary many years ago, I learned how, in such testimony, she was adept at undercutting these distortions, always trying to be as objective as the conclusions demanded. Mary is a real SRI hero in her leadership, competence, and integrity.

We are all aware that technology has hit us like an avalanche! Computers, and technology in general, have entered all facets of our lives, including the classroom. SRI's educational endeavors in the use of technology began in the early 1980s. In what ways can and should technology aid the several aspects of learning? Not just learning general facts but in communications, collaboration, and the tailoring and monitoring of individual development. How should both students and teachers adapt to this new world?



To answer such questions, in 1989 SRI formed a group called Advanced Instructional Technology, and its founding head was our awardee, *Dr. Barbara Means*. More than anyone else, she was responsible for the group's growth and continuation at SRI—now nearly three decades. Indicative of her

talents, she remained deeply involved in her research as she rapidly grew staff around her, becoming a center leader and even director of a division that reached a staff 120 and revenue of \$16 million before she returned to full-time research in 1999. Her clients were broad, from government to foundations, and her work has influenced the course of technology in education, helped along by her authoring or coauthoring seven books. She has contributed to educational policy at the highest levels of our government, testified before congressional committees, and participated in the deliberations of the National Research Council and many other state, national, and world education organizations.

In juxtaposition, it turns out that SRI is especially good at both blowing things up and protecting things against shocks—so good that people have paid for this work for more than 50 years. In particular, SRI's Poulter Laboratory developed more rigor about the modeling of such chaotic events than you would ever imagine possible. Two awardees this year were associated with that lab: Dr. Jim Colton was at SRI for 45 years and led Poulter Lab for 23 of those, and Dr. Don Curran was one of those who first developed the science and modeling of shock waves and how they can be used for a variety of testing and analyses.

In the East Bay hills two sites have been built to explore a huge variety of situations where explosive effects are important. These involve mostly how objects withstand shock, be it armor or pipelines; whether structures can maintain their integrity; and ways in which explosives are used to simulate the impact of other kinds of impulses in both air and water. More recently, the lab has vectored toward safety, including airplanes, hydrogen refueling stations, and the mitigation of terrorist bombs.



The work of *Jim Colton* for the Department of Defense and the Department of Energy has been acknowledged in very special letters from those clients, some of which have effusively documented his contributions to this science. He is another one of SRI's special talents who can carry on his own research with competence,

lead a large laboratory, and mentor those around him. If you know Jim, you know a modest, dedicated, and talented leader. Mohsen Sanai and Jim Gran both paid tribute to Jim as they introduced him.



*Don Curran* was a long-time director of SRI's Shock Physics and Geophysics Program in the Poulter Lab. He joined SRI in 1970 and at that point began a dynamic fracture program that became very successful, with hundreds of projects for both government and industry. Part of that effort was to

develop materials that could withstand strong impact and to determine the vulnerability of materials and structures to explosive shock. This work led to his authoring well over 100 papers and coauthoring three books. His talents were evidenced in his being named a Fellow of the American Physical Society, and he also received the APS's highest award, named, coincidentally, for a former leader of the Poulter Lab, George Duvall. In 2000, he was also the recipient of the Rinehart Award, given every five years by a European society dealing with the dynamic behavior of materials.

Don's role and contributions were presented by his colleague and friend, Don Shockey (also a recipient of the Rinehart Award in 2000). He told of his friend's brilliance, good wit, and interpersonal skills. Moreover, on a recent trip to Europe and through the early efforts of our Joyce Berry, the latter Don stopped in Norway to present the framed citation to Don Curran's widow, Liv.

The citations of this and previous years' awardees can be seen online at https://www.sri.com/about/alumni/members-alumni-hall-fame.

# A Successful Event

As always, thanks to the many people who contributed to the success of this event, which was ably planned and coordinated by Dave Harvey and staged by Arturo Franco, Roberto Vidales, and their SRI Conference Services crew. Augustina Biosic greeted attendees as they arrived, and Martha Agreda, Joyce Berry, Katie Kaattari, and Kathryn Morrison staffed the reception table. The ever-popular door prizes were generously provided by SRI Human Resources (represented by Gil Laredo) and the SRI Credit Union (represented by Steve Bowles and Francisco Saez). Linda Hawke-Gerrans created the reunion flyer and the Hall of Fame poster; and Joyce Berry produced the Hall of Fame awardees' certificates, as well as the name tags for attendees. Augustina Biosic, Harry Pettis, and JD Smith took the photographs you see here.



# 2017 ALUMNI ANNUAL REUNION (Concluded)



# Another Feather in SRI's Robotics Cap

SRI has long been known and highly respected for its innovative robotics program. The institute earned considerable early acclaim with its introduction of "Shakey," a robot developed at SRI from 1966 through 1972 that was acclaimed by Life magazine to be the "first electronic person." A recent addition to SRI's portfolio of robotics innovations is Robominer<sup>®</sup>, which has been developed in partnership with Enaex, a company that provides services to the mining industry, including blasting services for mining and civil works. ASI Robots, Thecne, and SK Godelius are also on the Robominer team.

Robominer is a remotely controlled robot designed to improve safety for mine workers, who often are endangered as they work underground, with the accompanying risks for mine collapses, poisonous environments, and other threats that have been estimated to be responsible for up to 12,000 worker fatalities annually. Robominer has a head and arms and a humanoid torso attached to a foundation with four wheels that enables it to traverse a variety of terrains carrying 10 to 20 pounds at speeds similar to those of humans. It has 3D vision and the capacity to monitor gases and temperature and to measure topography. Further advances planned for 2018 will enable Robominer to manipulate objects and materials. Robominer is making its debut in open-pit mines but is expected to be used in underground mining in the future.



SRI's Robert Pearlstein, vice president of corporate and international business development, has affirmed that "SRI is honored to collaborate with Enaex on important innovations in robotics that will help mine workers be safer, healthier, and more productive."

# Synthetic Lethality: A Weapon against Cancer

Precision medicine—the promise of using the right targeted drug to treat the right patient based on the power of genomics—is still



evolving. One of the current challenges is the limitations of current computational tools that can identify patients who are likely to respond to targeted therapies. SRI researchers are working on a new, computational way to identify genetic biomarkers that can be used to predict who will respond to targeted therapies. The method will speed clinical development of innovative anticancer treatments and can ultimately be used to create a precision medicine tool for the wider research community.

SRI researchers hypothesize that synthetic lethality can help identify predictive biomarkers for targeted anticancer therapies. In synthetic lethal interactions, the simultaneous presence of specific alterations in two different genes in a cell leads to death of the cell, whereas the alteration in only one of the genes in the cell does not. These researchers believe that genetic alterations in cancer cells can make them susceptible to targeted drugs through synthetic lethality. In other words, the inhibition of the drug targets (an alteration due to drug action) combined with the presence of the genetic alterations will serve as predictive biomarkers of response to the drugs.

Using synthetic lethal interactions, SRI researchers are developing a computational platform to identify biomarkers in lung cancer that will predict the efficacy of sudemycin-D6 (SD6), a novel splicing modulator. SD6, developed by Thomas Webb, Ph.D., Director of the Webb Laboratory in the Medicinal and Synthetic Chemistry Group at SRI, has been shown to have potent antitumor activity. The SRI team will use MiSL ("mining synthetic lethals," pronounced "missile"), a computational tool developed by researcher Subarna Sinha, Ph.D., Bioinformatics Program Leader in SRI's Biosciences Division, while she was at Stanford University, to mine synthetic lethal interactions from largescale primary tumor genomic and transcriptomic datasets.

Once predictive biomarkers are identified computationally, SRI researchers will experimentally validate them in two steps. First, they will validate the top candidate biomarkers using genetic approaches to silence the biomarker and a pharmacologic approach using SD6 in isogenic lung cancer cell lines in laboratory and animal studies. Second, they will confirm that the mechanism of SD6 sensitivity is via synthetic lethality between the biomarker and splicing factors.

SRI researchers expect that identifying predictive biomarkers will accelerate clinical development of SD6 as a treatment for lung cancer. The long-term objective is to create a tool for identifying predictive biomarkers that the wider research community can use, ultimately unlocking the clinical benefit of the available drug arsenal, furthering the clinical development of new targeted anticancer agents, and matching patients to treatment options that are likely to be effective.

This work is supported by the National Institutes of Health grant R21CA218778.

# Update on MOTOBOT: Robot Motorbike Attempts to Outrace Valentino Rossi

In 2016, SRI and Yamaha Motor Corporation announced their partnership in the development of MOTOBOT, a humanoid robot that can exceed a human in operating a motorcycle—with little or no modification to the bike. Their first goals with MOTOBOT were to independently navigate a slalom race course and run at a top speed of 100 kph (62 mph)—both achieved successfully with MOTOBOT Version 1. Aspirations for MOTOBOT Version 2 were to exceed 200 kph (124 mph), which was achieved in September 2017, and to beat the lap time of MotoGP star Valentino Rossi.

Now the race has been run. Rossi was easily able to beat MOTOBOT around California's Thunderhill Raceway's



The race between Valentino Rossi (left) and MOTOBOT (Image: Yamaha).

two-mile West course with a lap time of 85.740 seconds to MOTOBOT's 117.504. Although an almost 32-second margin may seem like a disappointing result for MOTOBOT, the progress and technological data Yamaha and SRI engineers have captured is incredible.

Although many have taken on the challenge to develop selfdriving cars, few are trying to build a robot that can ride a motorcycle. Why? As noted in *New Atlas*, "There's just so much more to take into account than when you're behind the wheel of a car: lean angle and body position, for starters, as well as clutch and sequential shifters, countersteering, separate front and rear brakes, weight transfer and a much more vivid relationship with traction at both ends of the bike." MOTOBOT has very precise track positioning sensors, as well as fine control over throttle, brake, clutch, steering, and gearshift inputs; however, it does not (yet) have the capability to lean over with knees skimming the ground.

Considering all the human interactions that come into play when riding a motorcycle, is it truly possible for MOTOBOT to outride the likes of Valentino Rossi? Maybe not, but that is not Yamaha's ultimate goal. Yamaha aims to use MOTOBOT's technology to "optimize control of vehicle dynamics [to] develop higher performing and safer forms of mobility." Robots such as MOTOBOT can help improve the design and engineering process, as well as the overall quality and performance of motorcycles. In addition, robots could push the equipment to its limit without putting human test riders at risk. Time will tell whether with continued development MOTOBOT can meet Rossi's lap time; meanwhile, the know-how that has gone into developing MOTOBOT goes well beyond the motorcycle.

Note: See the April 2016 issue of the newsletter for the original article on MOTOBOT.

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# SRI's Important Energy Research Programs: Over a Decade in the 1960s and 70s



# By Pat Henry

Andy Warhol is reputed to have said: "everyone will be world famous for 15 minutes." SRI was famous for its energy research for 15 years (or even more).

Beginning in the late 1960s and on into the 1980s, SRI was at the very forefront of energy technology research and, maybe even more importantly, was a major contributor to the national and international dialogue about the challenges of energy management. As usual, it began with an unexpected and imaginative project brought about by funding from a major oil company, Marathon Oil. It was supported technically with good advice from the newly formed (1961) government research organization, the Office of Coal Research (OCR). The government had been involved in energy/coal research from the 1940s, but urgency began to peak in the 1960s when there was a widespread opinion that the world was running out of oil, particularly the United States.

In 1967, Marathon asked SRI's Russ Phillips to help them assess the potential for converting coal to liquid and gaseous fuels. Russ asked me to help him lead the analyses, which would take us all over the world in search of data. We all knew that the Germans had operated much of their war machine on coal-derived fuels since they had much coal and few other energy reserves. Their scientists had developed a major process (Fischer-Tropsch) that basically broke down coal into its components of carbon monoxide and hydrogen, which could then catalytically be converted into almost any desired hydrocarbon. The process was expensive, but when you have no choice, costs are heavily discounted. After the war, the South Africans used the same (or modified) technology to once again convert their only indigenous fossil resource, coal, to provide needed oil and chemicals. The country was under international economic sanctions, including oil, for its political positioning. So Russ and I made important research trips to those countries as well as others-e.g., the United Kingdom (before the North Sea oil and gas reserves were found)-where coal research projects were under way. The U.K. also had major coal reserves of varying qualities and costs of recovery.

Meanwhile, the OCR was beginning to provide major funding to U.S. companies to develop technologies to convert coal to the *perceived* declining national reserves of oil and gas. With international energy prices mostly controlled by the Middle Eastern countries, those very low prices (\$3/barrel and under) were making it difficult or nearly impossible for other countries to develop increasingly costly national reserves. And almost all industry analysts used the U.S. Bureau of Mines to provide estimates of future costs to help them with their planning. Thus, given that the vast Middle East reserves were being freely developed (or rationed when needed), economic geologists were not actively looking at far-flung potential reserves that would be more expensive.

Given the fact that our analyses needed original research data, the SRI team hired its own economic geologists to "go out on a limb" and estimate future supplies at increased energy prices beyond those assumed in most international analyses. This was necessary, of course, so that we could put the new coal and other solid-fuel technological development into perspective with appropriate timetables for commercialization. We suspected, correctly, that there was much more information on international resource availability that had not been published or needed to be discovered through research. Also realizing (inspired by the Marathon work) that so much more technological research was needed, Russ and I launched a multiclient proposal in 1969 to take an extensive look at technologies available and under consideration to utilize solid fossil fuels for future energy supplies. Obviously, the need was recognized since, over a few years, SRI had more than 65 international energy and energy-interested companies chip in to sponsor the program. With such significant funding, we were able to add a number of innovative professionals (engineers and economists) to do the work. The annual presentations attracted hundreds of corporate participants from all organizational levels, from top management to researchers.

With the major deliverables and budget of the Solid Fuels Conversion Program (SRI number 6990) under me and Russ, the group began to add new staff members to complement the existing ones from the Marathon work. Among the first hires was Bert Louks, a propane fuel sales professional from Union Oil, who stated that he "could not do a material balance" or "any of that stuff" any more. This all turned out to be very untrue. We hired him to take charge of the coal gasification work, and he was a terrific and major addition to the project. Not only was Louks a very fine analyst, he turned out to be a wonderful mentor to new or junior staff members, an invaluable service to the team. Other team members at that time were Bill Clark (coal pyrolysis projects), Bob Murray (oil shale projects), Paul Roberts (tar sands projects), and Dick Schmidt (solid-fuels mining projects from the Physical Sciences Division), with the help of Stanford professor Evan Just. The "6990 team" had to

# **HISTORY CORNER (Continued)**

do original technoeconomic analyses ranging from solidfuel production through conversion to marketing—with an emphasis on costs and not necessarily on marketability (that was to come later as the Energy Center grew into national prominence). As an aside, Bert Louks and I won the Bituminous Coal Research Award for the best paper at the American Chemical Society's 160th National Annual Meeting in Chicago in 1970. It was on comparative coal gasification technologies and economic techniques.



Bert Louks, Paul Roberts, and Pat Henry (1970).

The results of most analyses showed that world oil prices would have to be at least \$10/barrel (in current/then constant dollars) so that these new processes and projects could be developed without subsidy. However, the issue of subsidy was always in mind since the United States still felt that it was running out of oil and would be totally dependent on outside events that were increasingly dangerous. U.S. oil production was in decline in 1970, and the world oil crisis (the embargo) of 1974 had the world totally frightened about energy futures. The stock market was hit hard.

With the government deeply concerned over running out of oil, the "Energy Crisis" was becoming a popular concern even before the embargo. With SRI so deeply involved in new research in most aspects of the global energy supply/ demand patterns, SRI management asked me to make a presentation to the annual meeting of the Board and Council (a group of some 50 very senior executives, which included presidents of oil companies, banks, universities, and other major entities) on our more optimistic perspectives on the "World Energy Crisis." This, of course, evoked considerable discussion among the industry executives, and it was agreed that our work was very important. In 1975, I was asked again to brief the Board and Council on the technological options that were being developed in the world of energy. It was a great opportunity to once again show major industry leaders how SRI's unique research was important to both the institute and the country.

It should be noted that 1975 was an especially big year for international energy economic publications, and SRI was beginning to receive ever more broad recognition for its work (even in local papers across the country, such as the Lynchburg, Tennessee, News and others; sometimes exceeded by even more controversy, such as the *National Enquirer*). Obviously, the SRI "surplus-in-time" position was vociferously questioned by many corporate researchers who were used to more dire projections. Time has shown that the Energy Center team was headed in the right direction because it was developing new economic facts and data. Bill Schumacher and Carl Trexel were very fine professional assets in this endeavor.

During all of this work, the SRI team had to go out on a limb and project world resources as prices increased around the world, even as high as \$10/barrel (equivalent to \$42 in 2017, so just about where we are today). We had to hire our own geologists to look at longer-range conventional supplies. Gene Harless and Joe Pelline (former corporate geologists, Texaco/Exxon) were invaluable. When the group started to discover that there was an amazingly large potential supply of traditional resources at rising prices, SRI began to speak out in public and was often openly challenged by the larger oil companies. The Center began to publish analyses and projections, and, in 1977, I was again asked to make a major presentation to the SRI Board and Council on this matter. At the end of the well-received presentation, which included the possibility of an energy glut in the future, one oil company CEO (conventional wisdom) suggested that the group "might toss the analysis in the trash can," to which I replied, "Sir, before you throw this well-based analysis in the trash can, you might ask your own economists if they can find fault with this very new and rare data." The man laughingly settled down and was actually very complimentary about the new work.

Dennis Maxwell, SRI's Corporate Public Relations officer, sent the executive summary of that talk to the news lines around the country. The day after Maxwell's summary hit the news wires, the phone rang in the early evening, and Mary Park, the Center's administrative assistant, said "Pat, Tom Brokaw in on the line." The Today Show's host wanted to know if we could appear on the show the following day in Washington, D.C., to discuss energy matters. As this conversation was going on, Mary interrupted to say that there was another call on the other line: "Walter Cronkite wanted to speak to you." Having already promised tentatively to be on the NBC program, I had to turn down the CBS request.

However, I needed to get SRI's approval before making the important TV appearance. Since a major part of SRI's annual funding came from government-sponsored research, we had to be careful to stay neutral and not appear to be against government policies in any way. A nonprofit organization, SRI had strict rules about well-documented and nonpolitical research in the research divisions. Policy research was carried out in a separate unit based in Washington, D.C.

So after a careful discussion, SRI's president, Charlie Anderson, and the head of most of SRI's governmental research work (based largely in the large and important Engineering Division) agreed that we must make the appearance (being cognizant of our role of impartiality). This turned out to be a challenge in that the Today Show had also asked Amory Lovins to appear with me. Lovins was an academic populist and an outspoken advocate of energy conservation and opponent of nuclear energy systems and was used to giving often outrageous speeches in support of his principles.

The TV appearance was tough. The Washington moderator—not Brokaw (in New York)—seemed to want to concentrate on nuclear power issues and not the matter at hand of energy options and futures. So, at one point, I decided to give an answer to a question that the host should have asked rather than answer his question directly. The nonnuclear and technology-optioned answer was designed to show the impartiality of the SRI analyses. It worked, and Lovins was sidestepped for the rest of the short show. At the end, the moderator said, "Dr. Henry, you did not answer my question on camera." I responded, "Sir, I responded to the question that you should have asked rather than the pointed and minor one that you did." The moderator seemed impressed and agreed. It was fine to have that ordeal over with.

Two other major events occurred about this same time in 1978. Admiral Stansfield Turner's office (head of the Central Intelligence Agency) called and asked me to brief his staff at a private meeting in CIA headquarters in Washington, D.C. Because I had a top-secret clearance, I had no difficulty in leading that workshop, held in the Pentagon. Turner himself led the meeting and discussion. He then suggested that I also brief the highly secretive group (funded by the Lawrence Livermore Labs) in La Jolla, California, who were major sources of international planning. Both meetings were constructive and challenging.

Within the SRI community, the work was recognized across administrative boundaries. For example, a major international top-leadership forum was organized and very tightly managed by Sr. Vice President Weldon B. (Hoot) Gibson, one of SRI's highly reputable founding fathers. On several occasions, Hoot asked me to make a short presentation and to lead a discussion around the highly controversial topic. I enjoyed these challenges, and Hoot (in a rare gesture) actually gave me small projects to cover the cost of these presentations, often held abroad in Europe and Asia.

With the Center's growing reputation on world-energy analyses, the solid-fuels program was morphed into a new multiclient program, ETEP (Energy Technology Economics Program), initially managed by Jim Moll. In addition to the solid-fuels work, all of the other technology options for the future-including nuclear (current and advanced, Ed Kinderman), solar, wind, tidal power, plant growth and production for carbon supplies (including the ocean), and anything imaginable-were analyzed by important staff members such as John Alich and Ron Dickenson. We even had to examine the potential for geothermal resources, which took us to disparate places like Iceland and Hawaii. The work also included a major look at conservation options to reduce overall energy consumption patterns. We were able to add strong new/young professionals like Jeff Witwer and Paul Meagher. During this period, the team was amazed to learn how flexible consumers at all levels were in changing energy resources between options (liquid fuels, natural gas, electricity, and others) as prices changed. Switching was not always immediately apparent, but, in time, it could have very major impacts on participants in the world energy supply and demand patterns. So we had to model decision-based consumer patterns, a tough job enabled by the Decision Analysis Group in conjunction with the Energy Center.

The big change for me came in the summer of 1978, when I accepted a position as partner with the major consulting firm of Booz Allen Hamilton in Washington, D.C. Jim Moll took over as acting director of the Energy Center, and after an executive search, SRI hired an outsider but well-known engineering professional, Hugh Guthrie, to take over. In 1979, Gene Harless, Jay Kopelman, and I published a major paper in the *Harvard Business Review*: "World Energy: A Manageable Dilemma" (May-June 1979). Although I was now at Booz Allen, the paper was based entirely on the SRI work and analyses. It was very well received.

# HISTORY CORNER (Continued)

#### December 2017



Four years after I left, in 1982, I would return to SRI but in a totally new role.

To be continued ..... Perhaps. Pat Henry joined Stanford Research Institute as a chemical engineer in the Physical Sciences Division in 1965. After managing several energy-related programs, he was Director of the Energy and Resources Center in the Economics Division from 1974 until 1978. He was invited to return to SRI in 1982 and was later asked by President Bill Miller to become Senior Vice President of the International Business Consulting Group. He resigned in 1991, after Bill Miller left SRI to rejoin Stanford University.

#### SRI Radars and High-Altitude Nuclear Tests

#### By Murray Baron

In the mid-1900s, the United States and much of the western world were involved in a Cold War with the Soviet Union. At that time, both sides possessed large numbers of intercontinental ballistic missiles (ICBMs) armed with nuclear warheads. The main deterrent to a "hot" war was fear of mutually assured destruction (MAD). Nonetheless, preparations had to be made in case a "Dr. Strangelove" situation developed. Thus, the U.S. Department of Defense funded research into ballistic-missile defense and high-altitude nuclear effects. Such research led to SRI's involvement in radar studies of auroras and of nuclear-weapon tests. This article describes SRI's radar work on Johnston Island in the mid-Pacific during a series of high-altitude nuclear tests in 1962.

Some context: In 1958, the United States and the USSR each had massive arsenals of ICBMs and nuclear weapons. During that year alone, the USSR conducted 34 A-tests; the United States conducted 77. The next year, 1959, the two countries agreed to a moratorium on nuclear tests. However, on 1 September 1961 the USSR resumed nuclear testing, conducting 58 tests through 4 November, including two at high altitudes. The United States followed with 10 surface tests. Planning began for U.S. high-altitude tests to be conducted from Johnston Island (JI), an atoll in the Pacific Ocean 1,200 km southwest of Hawaii. JI, shown in the picture at the upper right, is about 1 mile long by <sup>1</sup>/<sub>4</sub> mile wide with absolutely no trees. The nuclear devices were to be carried to altitude by Thor ballistic missiles launched from the far end of JI.

For these tests, SRI was tasked by the Defense Atomic Support Agency to make radar measurements of the ionospheric effects caused by the high-altitude nuclear events. To accomplish this mission, SRI had only 6 months in which to provide operational radars on JI.



#### Johnston Island.

SRI's site, located in the lower right area of the picture above, consisted of several radar and antenna systems, recording and photographic equipment, and ham radio equipment that we used to communicate among all the SRI stations in the Pacific, including Hawaii, Alaska, and the U.S. west coast. SRI had a "command center" on Oahu to coordinate all our efforts. Our electronic equipment and operator stations were in the two 40-foot vans shown in the picture below together with the antenna and the taxiway for the airfield.



SRI site on Johnston Island.

After the first two attempts to launch Thor missiles with nuclear warheads failed in June 1962, our project manager, Ray Leadabrand, realized that the team on Johnston Island needed some morale boosting. One day, a large wooden crate was unexpectedly delivered to our radar site. It was prominently stenciled "VARIABLE FREQUENCY, IMPULSIVELY ACTIVATED TONE GENERATOR." No one had a clue what that could be. On opening the crate, we discovered an old spinet piano, sawdust lying around its base. Ray knew that I played piano and had seen to it that I had one to help fill the boredom between attempted launches. As I played a few notes, my finger penetrated one of the keys, revealing a void underneath created by the termites that infested the piano. Despite the termites, we put the piano to use. Soon after its arrival, one of the techs at the site wrote the lyrics for "The Johnston Island Blues," which we then set to music and played/sang over the HF communications net for the enjoyment of the SRI team deployed throughout the Pacific basin.

Finally, on 9 July 1962, there was a successful test named Starfish. Starfish involved the detonation of a megaton-yield device at an altitude of approximately 400 km (248 miles). That spectacular event was visible for thousands of miles in every direction. It also led to an amusing sequence of events.



Starfish viewed from Hawaii.

As you can imagine, Starfish resulted in an abundance of long-lasting and widespread effects on radios and radars. I was in the control van operating the radars. Approximately 30 minutes after detonation, a Sergeant entered. He asked to speak to the site leader, who was me, to relay a message from the General who was commanding the tests. The General "asked" that I shut off all our radars because they were interfering with the General's ability to communicate with the President regarding the results of the test. In those days, long-haul communications were via HF radio (basically ham radio equipment) since it was before the time of communications satellites. I told the Sergeant, respectfully, that my orders were to continue operating the radars until effects on the ionosphere were no longer visible, and since I was still seeing copious effects I was not going to shut off our radars. He left to report back to the General's staff. Now, I was convinced that the SRI operations had nothing to do with the General's inability to communicate. All the SRI stations in the Pacific basin were using similar ham equipment to communicate among ourselves, and I was able to talk to most of the stations, including the SRI base in Hawaii—something I clearly couldn't do if our radars were the cause of the problem.

Well, about 30 minutes later, I was visited by a Captain, who made the same request as the Sergeant, only somewhat more firmly. My response was the same as to the Sergeant, and he went off in a bit of a huff. However, that was not the end. Subsequently, a Colonel came to visit. I chatted with him for a bit and pointed out the reason I was convinced that the SRI radars were not the culprit. He left! Shortly thereafter, some 100+ minutes after detonation, the ionospheric effects were no long visible on my scopes. I shut down the radars, generated a quick-look report, and called it a day.

Regarding "quick-look reports," as you might imagine, it was important for SRI project management to receive reports of our observations soon after each event. We generally had the communication means to do this via our ham radios that linked all the sites. However, we knew there were Russian trawlers in the Pacific whose mission was to intercept communications and spy on the U.S. tests. So we absolutely could not verbally describe the effects over the radio without breaching security and giving important information to the enemy. Therefore, a primitive way of coding our results was devised that consisted of placing supply orders to our base station in Hawaii. For example, ordering 3 cases of Polaroid film might mean that we received 30-db-strong signals on our 800-MHz radar; ordering 5 boxes of 1-inch magnetic tape might mean that we received 50-db signals on our 400-MHz radar. All the possibilities were thought of in advance, we believed, and a "code book" distributed to the sites describing the ordering system.

Imagine our puzzlement when, after the Starfish event, an order came crackling over the HF network for something like "six 5-inch I-beams, 4 inches long, <u>shipped upside down</u>." When ordering I-beams, the number ordered, the width, and the length were perhaps related to specific characteristics of the signals received. We had to think for a

while about why the order was placed demanding that the I-beams be shipped upside down. Shortly it became clear to us. Although we had expected the nuclear event to diminish the received signal, it had in fact generated additional radio noise and increased the signal. Hence the "upside down" shipment. Kudos to Jim Hodges on Canton Island, who figured out how to describe the results he was seeing in spite of those results being outside the code book's expectations.

The next bit of excitement came at a launch later that month, on 25 July. The countdown boomed over the speakers: "T minus five, four, three, two, one, zero, ignition..." And then, instead of "liftoff," came "NEGATIVE NEGATIVE NEGATIVE!" There was a valve malfunction, and the missile—with its nuclear warhead—was burning up on the launch pad less than a mile away. In the sequence of pictures below: (1) the missile on the launch pad just before rocket ignition; (2) the fuel fire starting shortly after ignition; (3) & (4) from a wider-angle lens and taken less than a second apart, the flames engulfing the missile and the warhead being (intentionally) ejected from the Thor; (5) the extent of the massive fire about 40 seconds after ignition.



SRI managers were very concerned about their staff in remote locations and their

families back home. After the Thor rocket with a nuclear warhead caught fire on the launch pad, less than a mile from SRI staff at the monitoring site, someone at SRI headquarters decided that the wives of SRI people on JI should be notified as soon as possible that their husbands were OK, and the notification should come before the wives had a chance to read the morning paper or hear morning newscasts. So, in the early hours of the morning, our wives were called and told "No matter what you hear on the news, your husband is OK!" Imagine how this went over, and whether it allayed fears or increased them. Oh well, management's heart was in the right place.

Launch pad repairs were completed on 15 October, and the Cuban Missile Crisis began on 16 October. I can clearly remember listening to reports on Armed Forces Radio and wondering if the powers-that-be would remember all the scientists and engineers on islands and atolls in the mid-Pacific while President Kennedy and the military were preoccupied with Cuba. Would we remain on this desolate island for months while attention was focused south of Florida?

Much like the Postal Service's "Neither snow nor rain nor heat nor gloom of night stays these couriers from the swift completion of their appointed rounds," and having nothing better to do, high-altitude nuclear testing continued concurrently with the Cuba situation. Four more highaltitude tests were conducted in October and November. Overall, SRI's radar effects data on this series of tests established the existence of radar "field-aligned clutter" from high-altitude nuclear events at both local and conjugate regions (effects at the conjugate area near Samoa were measured by the M/V Acania—see April 2017 newsletter). However, these measurements provided only indirect insight into the fundamental physics because of measurement constraints and lack of information on the basic parameters of electron densities, ion and electron temperatures, and plasma motions. In order to measure these parameters, one needs a much more sophisticated radar. And this led to SRI's involvement in incoherent scatter radars with field sites in Alaska and Greenland.

#### But that's another story!

Acknowledgment: I'd like to thank the SRI electronic technicians who supported the JI field site. Without them, I (a 24-yearold kid) would never have been able to operate the radars and perform the measurements: Frankie Domingo, Loren Dye, Ray Irvine, Jose deLeon. Apologies if I've left off anyone. Thanks also to Ron Presnell who trained me to operate the radar systems.

Pictures are courtesy of the U.S. Los Alamos National Laboratory. Herman Hoerlin, "United States high-altitude test experiences: A review emphasizing the impact on the environment" (LASL Monograph LA-6405), Los Alamos Scientific Laboratory, October 1976.

# SRI Alumnus Phil Green Received Prestigious European Inventor Recognition

Phil Green was one of SRI's most prolific inventors and also one who led SRI into the world of capitalizing on its inventions. In the early 1980s, Phil was on the lookout for those profiting illegally from his SRI patents. "Infringers" he called them, and through their pursuit SRI received licensing fees and court awards totaling millions of dollars. So, Phil was a prime mover at SRI and beyond. We just learned of an award he received in 2008 from the European Patent Office (EPO) for inventing and developing two important medical areas: ultrasonic imaging and surgical telepresence. The text and images below are self-explanatory. The text was written by Nado Vodopija, M.D.



(L to R), EU Council VP Guenter Verheugen, EU Council President and President of Slovenia Danila Turk, EPO President Alison Brimelow, Nado Vodopija, M.D., and Philip Green, 2008 Inventor of the Year.

# Da Vinci's Hands

# European Inventor of the Year 2008 in the category "Non-European countries"

It's a rare individual who makes two lasting and commercially viable contributions to a single field - rarer still that such a person can make the claim to have bettered the lives of millions in the process. Biomedical engineer Philip S. Green of SRI International, the non-profit research institute formerly known as the Stanford Research Institute of Stanford University, is one such man.

Beginning in the late 1960s, Green spearheaded more than two dozen inventions that made ultrasound a usable medical diagnostic tool. In the 1980s he began development of what is now becoming the world's most-used and most-trusted system for minimally invasive surgery. Green integrated advances in miniature cameras, stereo imaging displays, robotics and remote control systems to create a prototype that gave surgeons the visual and tactile sensations of being inside the patient - even though the surgery would be performed by robot arms through tiny holes.

Seeing it as way of allowing surgeons at remote hospitals to treat casualties before they bled to death on the field of battle, the US Army authorized significant funding for what was by then known as the Green Telepresence System. The team began their clinical testing in Belgium and quickly proved that Green's telepresence system gave surgeons not only superior control over their instruments, but a unique view inside the body through a magnified three-dimensional video image of the operating field.

Initially dubbed Mona (after da Vinci's Mona Lisa), the system was re-christened the da Vinci Surgical Robot in 1999 in honour of the man who had invented the first robot. In 2000 it became the first robotic surgical system to be cleared by the US Food and Drug Administration for general laparoscopic surgery, and has subsequently been authorized for use in cardiac, chest, urological and gynaecological and other procedures.

# How it works

The da Vinci robotic surgery system allows surgeons to perform complex procedures such as cardiac surgery through incisions as small as 1-2 centimetres. It deploys four robot arms, each of which carries a microtool: one for manipulating, one for cutting, and another for cauterising and a fourth for suturing. A movable cart next to the operating table holds the arms, while the surgeon sits at a sophisticated, ergonomically designed control console with a magnified three-dimensional view of the operating field.

The da Vinci's processors and software turn the surgeon's hand movements into extremely precise gestures of the microtools, each of which carries a stabilized camera to ensure the surgeon has a perfect and unwavering view of what is happening inside the patient's body. Each of the microtools carries its own microprocessor chip to help translate the system's interpretation of the surgeon's highly precise commands into cuts and sutures that are more steady and accurate than any human hand could make using a standard scalpel and magnified vision. The system also deploys patented motion-scaling and tremor-reduction systems.



Source: http://www.epo.org/learning-events/european-inventor/finalists/2008/green.html

# Flying a B17 Over Germany in WWII



# By Charles Cook

World War II started as a grand adventure for me. I always wanted to fly, and what fun it was to learn all about flying—and for free: Piper Cubs, PT22 Ryans, Vultees, Cessna twins, AT6s, B17s, and many more.

Bomber crew training was exciting, especially the night we ran into a thunderstorm at 27,000 feet, got severely tossed about, and came out of the bottom of the storm flying straight and level. My crew suffered many bruises, but we soon recovered and the 10 of us were proclaimed ready for combat. We flew a B17 from training headquarters at Lincoln, Nebraska, where I had lived since I was 11 years old, to England via Reykjavic, Iceland, where I celebrated my 21st birthday. We were sent to Ipswich in Northern England.



B17 Flying Fortress.

Two days after our arrival at Ipswich, I was told to gather my crew and all our belongings, because we were moving to the 94th Bomb Group at Bury St Edmunds, about 60 miles north of London.

We arrived at the 94th on October 3rd, 1944, and were promptly assigned our quarters, the officers in a Quonset hut and the enlisted men in tents. I moved my duffle bags in to find all of the last occupant's effects still there. Two days in a row the 94th had sent out planes and crews, and two days in a row none came back to Bury St Edmunds all the planes and their crews were lost. That day, October 7th, was the day I first confronted the realities of war. I now understood the gloomy mood of the base personnel. Moving out the personal effects of the previous crews was a sobering experience; could we be mortal and suffer a similar fate?

The months that followed were exciting, sometimes very frightening, but filled with the stuff that creates lifelong bonds between your fellow warriors and is incomprehensible to others who have not had similar experiences. But the stories behind these bonds can be simply told.



94th Bomb Group Headquarters, Bury St Edmunds.

Mission days were all the same. We would get up usually about 1 a.m. Breakfast, for those who flew the mission, included two fried eggs, a treat almost worth the risk of the mission. We would be briefed on the mission, get our plane ready, take off, join the formation, climb to about 27,000 feet altitude, where it was usually 57°F below zero, bomb about noon, come home, land, store our stuff, and go to debriefing. First was the Red Cross line, where we had our first food since breakfast, which was a glass of hot chocolate and sometimes a biscuit. Next came the medics, where we either drank a fourth of a water glass of Scotch or signed a waiver that the drink was refused. As pilot, I then had to go through a debriefing process, which sometimes was traumatic for pilots after a tough mission. Finally, we had dinner, often after 6 p.m., and then back to our guarters for a welcome rest. But all the missions were different; they ranged from exciting to frightening, but they were never boring!

I vividly remember our first bombing raid on Berlin; the flak was so dense we wondered if anyone could survive. Where were the metal chunks in that huge cloud created by exploding antiaircraft shells? But we flew through it and, in the end, this was a relatively easy mission for us. We were rewarded by the Air Force after the raid with a great photo of our crew, which we cherish, showing us leaving our plane in a truck to return for mission debriefing.



Bomb damage in Berlin.

Then there was the day a flak burst removed our entire rudder and vertical stabilizer. After landing back at Bury St Edmunds, Bevins, our 19-year-old tail gunner, got out of his position and saw that the entire rudder structure from about 6 inches above his head was gone. He promptly passed out. On recovery, he was unable to move; Bevins was paralyzed. He was taken to the hospital, where he remained paralyzed for several days. Finally, the doctors fed him a bottle of Scotch, and when he woke up from that treatment, he was normal and returned to his flight duties.

We were shot down twice. On one occasion, we suffered considerable flak damage-the plane could not return to Bury St Edmunds. As we were going down, a fighter plane came alongside and lowered his wheels, a sign to follow him. The Germans rebuilt our planes as they were shot down, so we never knew for sure which side the pilot was on. Since I had no choice, I decided he was American. We were led to a field near Vincennes, France. I saw a heavily bombed field through the misty rain while on a very short final approach, but I landed anyway, trusting our guide. The craters on the runway were filled in so our landing was rough, but OK. Two other planes landed that day, a B24 that did not believe the runway was safe so he veered to the left and crashed into a bomb crater, injuring his crew. The other was a B17 (with only one engine operating) that also did not believe his guide, veered right, ran into a farmhouse, and killed his crew and the French farmers in the house. The field was an abandoned German air base-there were no soldiers there, German or Allied. We stayed two days, finding some food in a local village. Finally, some Frenchmen came in a truck and told us to get in. We did. They took us to a big pasture about 45 minutes away, where a C47 transport plane was waiting to take us back to Bury St Edmunds.

Some of you may have visited Castle Air Force Base near Merced, California. The base has a collection of WWII planes and the 94th Bomb Group Museum. The museum features our commander, General Frederick Castle. He was killed on Christmas day at the Battle of the Bulge while leading the mission that day. I was flying box, the position just under Castle's plane, in a four-plane "diamond" formation. There were nine such elements in the Bomb Group formation. An estimated 250 German fighters attacked us; our fighters were late and had not yet appeared. General Castle was shot down and killed with the rest of his crew. Our B17 had no damage, and we returned home safely. Once again, we were lucky!



Castle Air Force Base.

On another raid to Hamburg, we saw many Allied and German fighters. That day the U.S. Army Air Forces shot down the largest number of German planes of any single day of WWII, 157 of them. Our plane even got credit for part of a fighter. That was an exciting day—so exciting that our ball turret gunner, Vess, had an accident, shorted out his electrical flying suit, and frostbit his rear. As usual, the German fighters shot bullets that glowed, so we could see them coming at us. We could also watch incoming flak shells, and we knew they would explode at about our altitude. But all we could do was watch, hope, and wait.

A submarine shot at us on another raid while flying over the North Sea en route to our target. It blew out the windscreen in front of me, so I flew the rest of the mission under very cold ( $-57^{\circ}$ F) and windy conditions. My electrical, fleece-lined flying suit was far from being cozy. How weird it was to be hit by a submarine.

Then there was the day when my bombardier, Dahl, got hit in the chest by a large piece of flak. The impact threw him over the head of the navigator and slammed him into the bulkhead in front of the cockpit. Luckily, he was wearing his heavy metal flak suit. The flak fragment bruised him severely; his chest became very black and blue, and his ribs hurt for weeks. What a scare. But think of the alternative.

On another mission, my engineer, Nabors, who was manning the top turret, claimed he was wounded. A piece of flak did go through the turret, and it sprayed shards of

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Plexiglas everywhere. The shards punctured his oxygen mask, and when he took off his mask, he looked like he had a severe case of measles. They stung and hurt. He had a reason to be shaken and excited. But according to Air Force rules, he was not wounded enough to get a Purple Heart. That was OK with Nabors and the rest of us. Good thing he was wearing a steel helmet and his flak suit.

Some exciting times did not include flak and fighters. Twice I took off with an overload of bombs and fuel when it was so foggy that I could not see the ground from the cockpit and could not taxi. The ground crew pulled our plane to the runway, set the wheels on spots on the runway for alignment, and told us to go. Some planes didn't make it and exploded on or right after takeoff. The next plane in line was sent off anyway. Once, we landed under the same conditions. We knew others were trying to land after us. They also were unable to see anything after they landed. After landing, we taxied and then got out of the plane and ran, hoping we were at Bury St Edmunds and no one would run into us. We did not have modern landing aids during WWII.

There was a time the 94th Bomb Group tried to save enough gas to get back to base after a very long mission. Each plane returned from the target alone at low altitude. As usual, the weather was bad. We were about 5,000 feet above the English Channel when all four engines quit because of carburetor ice. We got them running just in time to prevent a ditching in water so cold that survival time was only a few minutes. All of us were horrified at the prospects of ditching.

There are similar stories I could tell about other missions. But this gives you a good idea what it was like flying B17s over Germany in WWII. It was never dull. Living through those days forged strong bonds to our fellow airmen, but they were especially strong between crew members. Our memories are as fresh today as when we were flying together.

We were lucky. My crew and I, all 10 of us, survived our assigned 35 missions—the last one was on March 12th, 1945—without even gaining a Purple Heart.

Charles Cook joined SRI in 1954 as a physicist in the Chemical Physics Department. In his 27-year career at SRI, he progressed through a series of management positions in the fields of physical and life sciences, chemical industries, and energy, culminating in the position of Senior Vice President, Research Operations. His interests included atomic and molecular physics, as well as applied research such as development of a magnetically levitated high-speed train and automation in manufacturing and computer-based systems.



#### **Eclipse Experience**

#### By Murray Baron

"Shall we go to Oregon to see the August 21 total solar eclipse?" I asked my wife last spring. Her son and family (wife and daughters, ages 10 and 12) were to arrive from Norway on the 15th, with the girls staying with us for three months of school in Menlo Park. "Sounds good to me," she said, "let's ask my son." "Absolutely," he said, "what a great experience for us all. But we have to be back on the night of the 21st so that the girls can go to 'Meet the Teachers Day' at their new school on the 22nd."

So with that, we booked air tickets, hotel, and minivan rental. The six of us would stay the night before the eclipse in Portland, drive 45 minutes south to Salem near the eclipse center line in the morning, and park in a shopping mall that had fast-food restaurants and restrooms to view the eclipse. If we left the mall shortly after totality, we would have 3.5 hours for driving back to the Portland airport to catch our plane home—a 45-minute drive without traffic.

When we checked into the Portland hotel the day before the eclipse, several people in the check-in line were also there to view the eclipse. Some said they would leave the hotel at 3 a.m. to drive to Salem. We decided to have a quick breakfast before we left for Salem, and that worked out fine. There was a bit of traffic, but not bad, and we arrived at the chosen shopping mall two hours before the start of the eclipse. We were surprised that the mall parking lot was full of people with camping chairs, cameras, and picnic baskets, as well as quite a number of large tour buses. After some searching, we found one of the few remaining parking spaces.

"Let's walk over to the Starbucks for a coffee and restroom stop." When we got there, we encountered two long lines snaking out the door. One was for coffee, the other for the restroom. All the fast-food restaurants in the mall had identical situations. No matter, we had plenty of time before the eclipse.

The eclipse was spectacular. During the last few minutes before totality, the light dimmed, the temperature dropped noticeably, and oohs and aahs were heard from the assembled crowd. When totality started, aerial fireworks were launched by some of the observers and exploded brightly overhead.

As the sun started to emerge from totality, we jumped into the van to start our drive back to Portland. But **whoa!** Everyone else had the same idea.



My photos of the eclipse, assembled into this sequence by my son, Ron. For you photo buffs out there, all but the last two photos (totality) were taken using a 100,000x neutral-density filter. The last two were taken without the filter.

It took us 30 minutes to get out of the mall and onto the ramp to the freeway going north. Once on the freeway, it was stop and go. Every on-ramp had a line of cars trying to enter. After 1.5 hours, we hadn't gotten even halfway to the airport. It seemed as if most of the population of Portland, as well as half the people in the state of Washington, had viewed the eclipse from the vicinity of Salem and were now on their way home. Clearly, we would miss our flight. A call to Southwest Airlines revealed that all later flights to any of the three Bay Area airports were fully booked, as were all flights on the following day. The only way we had a chance of getting home in time for the girls to be at the "Meet the Teachers Day" was to drive in our rental van. And, we noted that although traffic going north was extremely heavy, traffic headed south was light. So after a call to the rental agency, we turned around and headed south. The drive from Salem to Menlo Park normally would take about 10 hours, so we thought we would arrive around midnight, allowing for some food stops.

Wrong! Although traffic was light on the way back to Salem, it became heavy as we headed south from Salem. It seemed as if most of Southern Oregon plus half of California had hit the road to return home from eclipse viewing. Traffic remained heavy all the way down Interstate 5 until we were 80 miles from home. We arrived at 3:25 a.m. after a 17-hour ride in the van! The girls made it to school after minimal sleep. And we all have stories to tell.

Was it worth it? Hell yes!



The SRI Alumni Association welcomes new members:

Pauline Bourbon Steve Bowles Max Crittenden Brian Engleman Bob Gilligan Li Gong Barbara Means Christine Orich Alice Resnick Jeremy Rochelle Patricia Schank Jeanie Tooker Amnard Vorachard Mary Wagner

And welcomes back previous member:

# Helen Wolf

We look forward to your participation in the Alumni Association and hope to see you at our next group event.

# Who Do You Believe Made an Exceptional Contribution to the Success of SRI? Nominate That Person for the SRI Alumni Hall of Fame!

The SRI Alumni Hall of Fame honors former staff members who made exceptional contributions to the success of SRI. We are seeking nominations for Hall of Fame candidates by June 1, 2018.

All former staff members are eligible, but nominees should meet the following criteria:

- Significant, lasting contributions to the success of SRI
- Contributions recognized by staff, management, or clients
- Contributions in any area of research, management, or service, such as
  - Establishing a new laboratory or a new field of research
  - Performing an outstanding recognized service
  - Clearly demonstrating qualities of leadership, vision, and creativity
- What did the person leave behind?
  - Enhanced reputation for SRI
  - New or enhanced research, business, or support activity or facility.

Please prepare a write-up of about 300 words indicating how your nominee meets these criteria. If you have questions about the nomination process, members of the Steering Committee will be happy to answer them. Send the writeup or questions to steering-committee-alumni@sri.com or SRI Alumni Association, 333 Ravenswood Avenue, AC-108, Menlo Park, CA 94025-3493. Again, the due date is June 1.

# Wanted: Your Submissions

Do you have an eclipse story to share? Have you done something interesting or traveled to interesting places? Received any awards or honors? Your fellow alumni want to know! We welcome articles and shorter items from all Alumni Association members to be considered for publication in the newsletter. Please send items to steering-committee-alumni@sri.com.

# Heads Up! 2018 Spring Fling

The Spring Fling is tentatively being planned for a weekday in May. We promise a very interesting venue. Details will follow in the April newsletter along with the official invitation and sign-up sheet.

# Save the Date: 2018 Annual SRI Alumni Reunion

The annual reunion will be held on Thursday, October 18, from 4:00 until 7:00 p.m. at SRI. More details will follow in the August newsletter along with the official invitation and sign-up sheet. We hope you can join your fellow alumni then.

# **CREDIT UNION NEWS**



# **Directory Addendum**

The enclosed directory addendum (covering the period August 1, 2017, to November 30, 2017) contains new members and corrections. Please add it to your 2017 Directory.



# Boyd C. Fair\*



Boyd Charles Fair Jr. died from complications of liver cancer on October 5, 2017. Boyd was born in Beaver Falls, Pennsylvania, on December 6, 1937. When Boyd was 8 years old, he moved with his parents, Alice and Boyd Fair, and his sister, Janet, to California. They settled in Campbell, back when the

area was filled with apricot orchards.

Boyd earned his Electrical Engineering degree from San Jose State University in 1959 and quickly found his dream job at SRI in Menlo Park. Over his 40+ year career at SRI, Boyd contributed to countless projects, including radar measurements of the aurora and radio frequency observations of high-altitude nuclear events, sending him off to work in such remote locations as Poker Flat, Alaska, and from ships in the middle of the Pacific and Indian oceans. Boyd was one of the first at SRI to be certified to build space-qualified hardware. He built equipment that flew on the Pioneer Space Probe and on the Wideband series of satellites. He led a project that first brought Internetlike communications technology to Air Force planes-in this case, those of the Strategic Air Command. That effort involved experiments that culminated in the deployment of packet radio technology on two aircraft that communicated with each other via the radios and the Internet. Boyd also was the project leader for the development and experimental use of a state-of-the-art system that collected very-highresolution information on the effects of forests on radio signals that propagated through them. Many long-lasting friendships resulted from his SRI tenure. It was through one of his SRI friends that Boyd was first introduced to Joan, which was the beginning of a friendship and eventually a marriage that would last more than 48 years.

Encouraged by Joan, Boyd learned to enjoy skiing, travel, and other family adventures. Although Boyd and Joan had no children, they had special relationships with their nieces and nephews and "the grands." Each year at Christmas, Boyd set up the train he received from his father at age 1 under the Christmas tree for the enjoyment of himself and all the youngsters of family and friends. Uncle Boyd was a hero at fixing things; as his youngest grandnephew said at age 3 when his Tommy Tunes train broke: "Uncle Boyd can fix it." After more than 40 years at SRI, Boyd retired to spend more time with his wife and extended family, and to play more golf, seeking to "shoot his age." He also volunteered many times as a marshal at professional golf events, including the AT&T Pebble Beach PGA Tournament, the Champions Tour First Tee Open, and the U.S. Open. Throughout his retirement, Boyd maintained his relationships with SRI friends through the SRI Golf Club and Twilight League, a weekly "lunch bunch" group, and as an active member and—for many years—Chairman of the SRI Alumni Association Steering Committee. According to a former committee member, "Boyd was the glue that held us together. Just knowing he was there was comforting."

During his last week of life, Boyd was visited by two of his grandnieces. They had always ended visits with Boyd telling him "love you." On the evening of October 5th, when he told them how pretty they were, they said "love you" before leaving his room to let him rest. Boyd passed away within the hour, with a full moon shining through the open curtain. As Joan says, "Our family knows we will have a visit from Boyd every full moon."

Boyd's enduring love of family, his kind spirit, and his capricious humor will be missed by his wife, Joan; by Joan's sister, Lois, and her children, Jane and Matt, and their families; by Joan's brothers, Kirk Foley and Douglas Foley, and their much-loved families; and by Boyd's sister, Janet, and her spouse, David Faris, and their sons, Todd and Scott Faris, and their families.

To honor Boyd, we ask that you do something special for your loved ones: a walk together, a handhold, or hug. That is what Boyd would always do at times like this.

Based on the family's obituary, which was distributed at the celebration of Boyd's life on November 8th.

The SRI Golf Club has ordered a commemorative brick in Boyd's memory, which will be placed at the entrance to the Northern California Golf Association offices at Poppy Hills Golf Course. Boyd was president of the club from 2013 to 2017. Proceeds from the bricks benefit Youth on Course, an organization for young people that Boyd strongly supported.

# Elaine Hatfield\*



Long-time Palo Alto resident Elaine Hatfield died August 31, 2017, at her home in the Green Meadow community of South Palo Alto, at age 99. The cause of death was complications from pancreatic cancer and advanced Alzheimer's.

Elaine was born August 14, 1928, in Whittier, California, to two

school teachers, Vera and Fred Weiss. She attended Stanford University, where she majored in economics and later received a master's degree in statistics.

Elaine was one of the first women to enter the computer science and engineering field. After graduation, she worked for the National Security Agency in Washington, D.C., cracking codes by using statistics. After three years, she moved back to Palo Alto and worked as a statistician for C&H Sugar in San Francisco, as one of the first computer programmers at United Technologies, and as a computer scientist for Lockheed Corporation. She then took a position as a research engineer for SRI, where she focused on developing software to model the ionosphere in order to facilitate long-distance communications.

Elaine was an avid bridge and tennis player and an active member of the Unitarian Church of Palo Alto, as well as the National Audubon Society, Parents Without Partners, and the Friendship Force. She traveled throughout the world with the Friendship Force during her retirement. She was extremely social and had hundreds of friends in the Bay Area related to these activities and clubs. Her activities were restricted in the last 10 years by the advancement of Alzheimer's, but she remained in her home of 60 years in South Palo Alto and was able to continue to attend the Unitarian Church and enjoy activities throughout the Bay Area and beyond.

Elaine is survived by her son, Jay Hatfield, and her four grandchildren, Katherine, William, Andrew, and Benjamin, as well as her brother, Robert Weiss.

Based on an obituary published by the San Francisco Chronicle.

# William F. Miller\*



William F. Miller, former SRI President and CEO, died Sept. 27, 2017, in Cupertino at age 91.

Bill Miller was born on a farm in Vincennes, Indiana, in 1925. After serving in the U.S. Army during World War II, he earned B.S., M.S., and Ph.D. degrees in physics from Purdue University.

Seeing the potential of computers to solve mathematical, science, and business problems, he joined Argonne National Lab in 1956, where he pioneered the field now known as computational science. In 1964, he was recruited to Stanford University, where he was instrumental in developing its computer science programs and resources. As Stanford's Provost (chief academic officer), he helped to make Stanford into one of the world's top universities. He expanded the university's multidisciplinary and international programs, removed the cap on enrollment of women students, and provided incentives to deans and department chairs to hire more women and ethnic minority faculty. During a time of student war protests, Bill advocated moving classified research off the campus to SRI (then known as Stanford Research Institute).

After eight years as Provost, Bill took leave from Stanford to become President and CEO of SRI in 1979. During his 11-year tenure, he led SRI through a period of expansion and diversification. He established a successful program to commercialize SRI's many inventions through licensing and spin-off companies; created unprecedented international collaborations, particularly in Asia; and acquired RCA Laboratories (which later became the Sarnoff Corporation and is now fully integrated into SRI).

Bill left SRI in 1990 and returned to Stanford, where he turned to focusing on innovation and entrepreneurship, particularly in Silicon Valley. He also was involved in Silicon Valley as founder, director, or president of several startups and served on the boards of several major companies. In both the academic and business worlds, his ability to see connections among different disciplines led him to support the financial and intellectual property infrastructure in Silicon Valley. He understood that the development of Silicon Valley was as much about culture as it was about technology.

# **IN MEMORIAM (Concluded)**

In later life, Bill and Patty, his wife of 59 years at her death in 2008, became passionate advocates for wildlife conservation. He gave away more than half of his assets during his lifetime, including more than \$1 million to wildlife conservation programs and funding for endowed professorships at Purdue and Stanford. He was also a generous supporter of programs aimed at helping people get out of poverty.

Bill is survived by his son and daughter-in-law, Rodney and Olivia Miller of Redwood City, and by his brother, James L. Miller of Vincennes, Indiana.

Based on obituaries published by the San Jose Mercury News and Stanford University.

# Georgia Schwaar

Our sincere condolences to former Steering Committee member Bob Schwaar and family on the death of Bob's wife, Georgia, on August 1, 2017, at age 84. Bob and Georgia had been married for 60 years.

\*Member of the SRI Alumni Association



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