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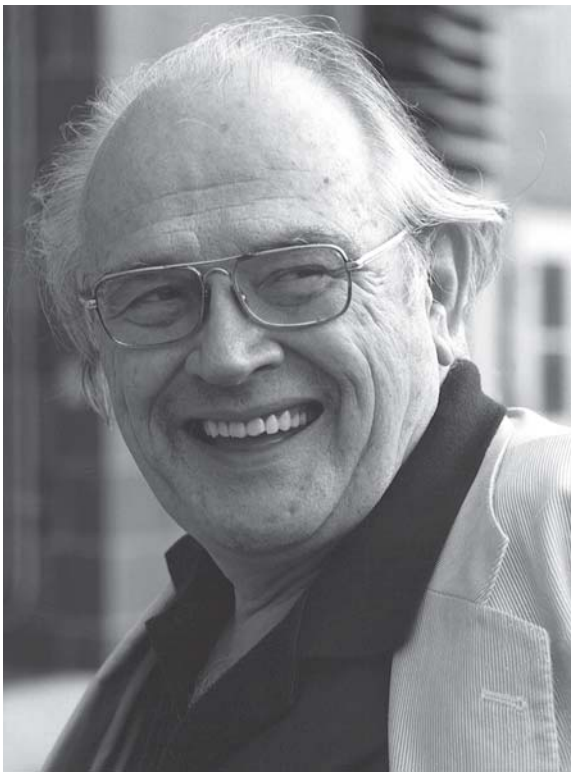
For Your Information

Volume 6, Issue 1

A Special Issue

Compiled and distributed by the Pride in Development committee for the purpose of providing Development Division employees with information on the latest happenings within the Division and the Y-12 Plant.



A Heroic and Well-Loved Friend and Colleague Passes On

The passing of our friend John Googin has been remarked by news articles in the *Oak Ridger* (1/17/94) and the *Knoxville News-Sentinel*, by the *Energy Systems News* (1/27/94), as well as a full-page feature in the *Oak Ridger* (2/7/94). But we who had the pleasure of working with him at close range over the years have many thoughts about, and memories of, this remarkable man. This special issue is an opportunity to share these things, as well as to document John's own personal Manhattan Project history. Much of that history has appeared in chapter form in previous issues of this publication, but we have repeated it here as a whole, the previously unpublished material concluding with the dropping of the Hiroshima bomb.

John's middle name was "Melvin". There are probably many people who saw him work that could have sworn it was "Merlin". He was called on by many at all levels in the Corporation, the DOE and other national agencies and organizations to give advice and counsel. This included, in recent years, nonproliferation intelligence analysis, and also various technical issues that the National Academy of Engineering was concerned with. One should remember that his election to Academy membership was not just a reward and honor, but an obligation to serve by working on panels and ad hoc committees.

John was an ambitious man, and admired ambition in others. But his personal ambition was a very special kind, not requiring validation by rising in a formal bureaucratic hierarchy.

Thus, his highest administrative rank was Department Head (Chemistry Development Dept., predating Jim Schreyer); he moved from that into Senior Staff Consultant, which is what his business card said to the end (and said it in Kanji on the back of one version). His code level was Senior Corporate Fellow, but when asked to describe himself, he simply said, "Physical Chemist". Of course, he subsumed into that all of chemistry, metallurgy, and much of engineering and physics.

Those who attended John's funeral service were struck by the appropriateness of it all. Many such services are carried out in such a way that the individuality of the deceased disappears. The celebrants just repeat formula statements and you wonder if they even knew the person. Not so here - it was very personal. And one objective fact stands out: Pollard Auditorium seats exactly 300, and there were no less than 350 there. It is clear that John touched the lives of all 350, and many others that were not there.

We have included John's personal resume and information about his publication history. We have also given him the last word; one of the many columns he contributed to this publication (originally published November 1989) is repeated here. His columns covered a wide range of topics, including the EPA & KGB, information security/OPSEC, Mikhail Gorbachov's personal history, etc. The column we selected is by no means the most entertaining of this lot, but it does have personal significance to us all.

Born Lewiston, Maine - May 2, 1922

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A BIOGRAPHY OF

DR. JOHN M. GOOGIN

Educated in the public schools of Lewiston, Maine. Graduated among the top ten of his high school class.

Undergraduate work at Bates College in Lewiston, Maine. Majors taken in Chemistry and Mathematics, minor in Physics. Graduated B.S. in March 1944, Phi Beta Kappa.

Graduate work at the University of Tennessee. Ph.D. in Physical Chemistry in 1953. The degree taken as a part time effort while employed as a research and development chemist in the Y-12 Plant in Oak Ridge, TN.

Thesis work on the separation of the isotopes of hydrogen. Elected to Sigma Xi.

Married to Janet H. Horn of Reading, PA in 1949. They have four daughters, Jacqueline, Diane, Laura and Roxanne.

Began professional work at Oak Ridge for the Manhattan Project, May 11, 1944, as a junior chemist in process development for the Alpha Uranium Recycle of the Calutron Electro-magnetic Isotope Separation Process in the Y-12 Plant. Y-12 produced the highly enriched uranium 235 for the U.S. atomic weapon effort until 1947 and has since done special isotope separations of many of the elements with one building of Beta Calutron units.

Dr. Googin with wife and daughters in 1969.

Y-12 was operated by the Tennessee Eastman Division of the Eastman Kodak Co. from 1943 to 1947 and by the Union Carbide Corp. between 1947 and 1983.

Senior Staff Consultant to the Development Division of the Oak Ridge Y-12 Plant. Y-12 is a manufacturing facility of the U.S. Department of Energy devoted to the production of components for weapons and special reactor applications that are based on lithium, beryllium and uranium. Since 1983 the facility has been operated for the DOE by Martin Marietta Energy Systems, Inc.

Served as a senior consultant to the Gaseous Diffusion Plants, was a senior investigator in the Gas Centrifuge Program, an advisor to the early Plasma Separation and Laser Isotope Separation Programs, involved in the Chemical Exchange Separation of isotopes. Had extensive background in chemical, ceramic and metallurgical engineering with emphasis on beryllium, graphite, tungsten and other refractory materials, thorium and uranium. Served as an advisor to the DOE intelligence activities.

Granted one of the Ernest Orlando Lawrence Awards, a $5,000 prize, by the Atomic Energy Commission in 1967 with a citation in Chemistry and Metallurgy. The award was based on contributions to the uranium processing activities in Y-12, to the first U.S. plant for the separation of zirconium and hafnium and to the production plants for the separation of the isotopes of lithium and production of associated lithium products.

Given an Honorary Doctor of Science by Bates College in 1968.

Was made a Fellow of the American Society for Metals in 1974 for contributions to metallurgy of uranium, uranium alloys, and hydro-metallurgy.

Appeared on U.S. Public Television's Nova Series in the "Plutonium Connection" as a specialist in the processing and control of fissile materials in 1975.

Participated in an Industrial Research Magazine IR-100 Award for the development of an anaerobic fermentation packed column reactor for methane generation in 1976.

Was made a Research Fellow of the Union Carbide Corporation in 1976.

Participated in an IR-100 Award for the development of an improved solar energy collector in 1978.

Given McGraw-Hill's Chemical Engineering Magazine's Award for Outstanding Personal Achievement in Chemical Engineering in 1982. Because of the nature of the work done, this was granted to a

single person rather than to a group as is often done.

Made a Corporate Fellow of Martin Marietta Energy Systems, Inc., in 1984.

Made a Senior Corporate Fellow of Martin Marietta Energy Systems, Inc. in 1987.

Given the 1987 William J. Kroll Zirconium Medal of the W. J. Kroll Institute for Extractive Metallurgy in 1988.

Made a member of the National Academy of Engineering in 1988.

Given the ASM International Gold Medal for life long contributions to the field of Materials Technology in 1989.

Analysis of inspection data and presentations on implications to the IAEA inspectorate and board of governess on the nature of the Iraqi program for enriched uranium production by electromagnetic techniques 1991.

Participated in an Excellence in Technology Transfer Award from the Federal Laboratories Consortium in 1992.

Participated in an IR-100 Award for a catalytic process for the decomposition of hyperchlorite to chloride and oxygen in 1993.

Holder, or coholder, of more than a dozen patents in the fields of chemistry, chemical engineering, bioengineering, metallurgy and ceramics.

Was active in local professional societies, the PTA the president of the local council, the ACLU to president of the Tennessee Chapter, the Democratic party to the local executive board and the Unitarian Universalist Church to president of the Oak Ridge church.

Professional Societies

American Chemical Society
American Association for the Advancement of Science
ASM International

The recipient of many awards including this one from McGraw-Hill for outstanding personal achievement in chemical engineering.

PERSONAL NOTES, REMEMBRANCES AND PRAISES FROM FELLOW FRIENDS AND COLLEAGUES

Memories of Dr. Googin's Younger Years

It was a typical hot, sultry, summer day in the late 1950s. I was 20 years old, having just come to work at Y-12 in the Mechanical Engineering Department of the Engineering Division. My job was to detail design tooling for whatever was needed. Y-12 had recently experienced its first and only nuclear accident, and everyone had become extremely sensitized to nuclear safety issues. At this time, I was assigned a drawing board located on the unairconditioned back porch of building 9739.

One hot afternoon, Leo Hemphill walked onto the back porch and said that he needed a designer to attend a meeting with Dr. Googin and Strohecker. They were going to review enriched weapons parts' transportation and nuclear safety issues and would need some detail design support. I was selected to provide that support.

I had been asked to help the highest technical gurus of Y-12. To me, this was likened to being invited to a meeting between the Father and the Holy Ghost themselves! As you can see, both men's reputation had preceded them. I went to the meeting at the appropriate time and place. Dr. Googin arrived; then Strohecker arrived. Within a few minutes, they began discussing the relative merits and hazards of masses, geometries, and spacing and reflector characteristics. The meeting proceeded with each man expressing his point of view in his own eloquent and very assertive, but easy to understand, way. Within an hour, the design fundamentals were established, preliminary sketches were made and reviewed, and I was told to prepare a producible design for the first "birdcage". A day later, the design was complete and prototype fabrication was started.

That first, chance meeting developed into a long and lasting relationship of technical support between Dr. Googin and myself. He would overview the fundamentals and I would occasionally be asked to help with the design. The last time that he called me was about January 10, 1994. I will forever cherish that chance meeting in a summer of the late 1950s. *L. A. Abbatiello*

The circumstances of this anecdote regarding John took place during the early days of Y-12 (~1945). Tennessee Eastman was the operating contractor at this time.

To help solve myriad problems in the start-up of the plant to achieve its mission, a committee of six or seven very bright young men were selected and set up in a suite of offices in Building 9706-1. This group was familiarly known as the "The Brain Trust." Their backgrounds consisted of various disciplines: chemistry, physics, engineering, etc. They were the bright young scientists of Y-12's future.

John was a member of this group who normally ate lunch together. One of these young men was jealous of John's intelligence. His greatest pleasure seemed to be to try to find some technical topic in which he could raise questions that John could not answer. He used the fine print of many college textbooks but he never one time had a question that John could not answer correctly.

(This bright young man is now, if he hasn't retired recently, a top executive with one of the country's large corporations.) *Anonymous*

A Wake for/ of John Googin

Until this moment, it never occurred to me how appropriate the term "wake" is for this sort of thing. "Wake" not only has a funereal meaning, but it is "the track left by a moving body in a fluid". The wake still exists and moves, even when the generator is gone. Such is the case here, for the works left behind by this man in this "fluid" world will live on.

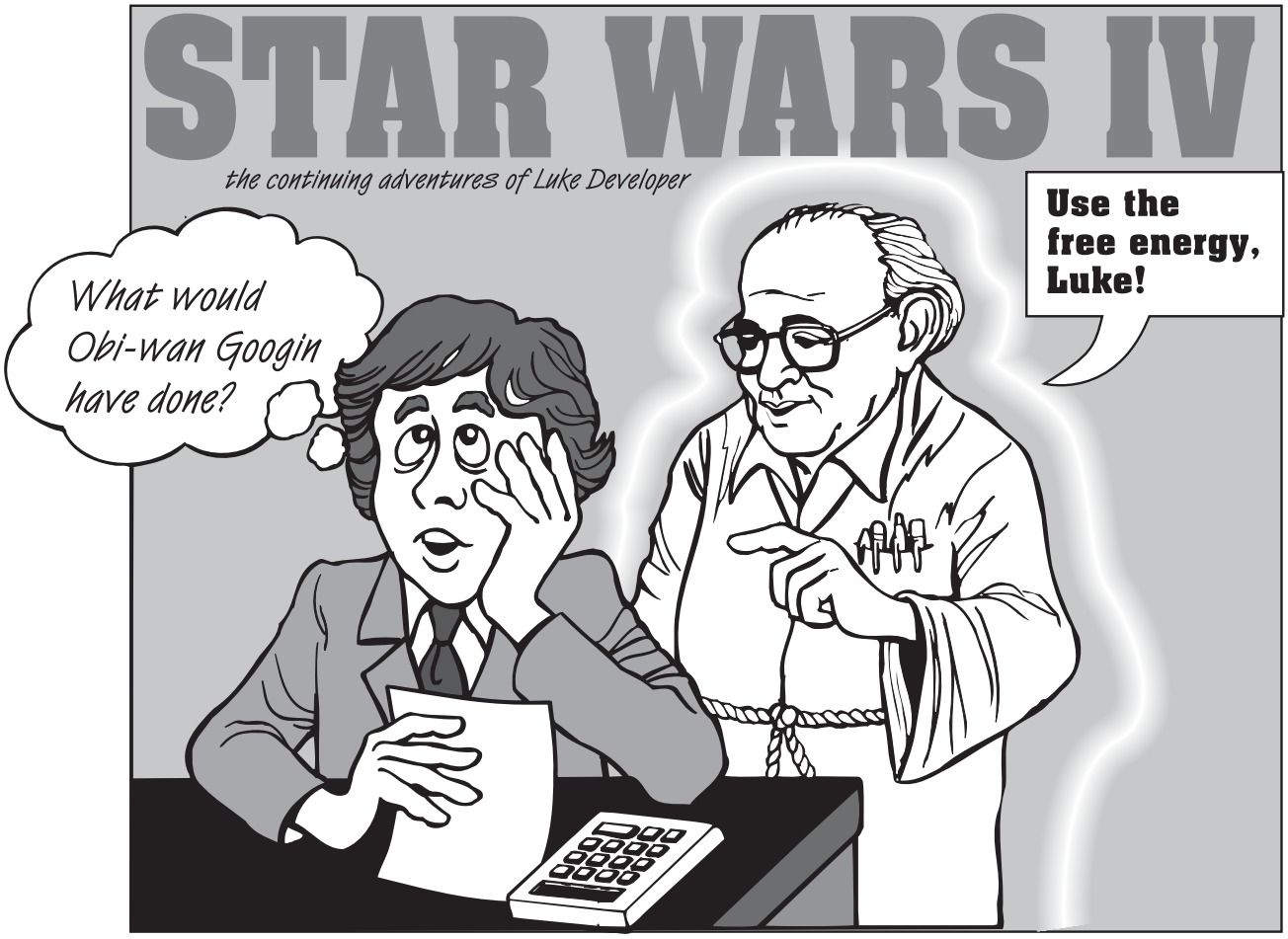
Depending on your age (and closeness) relative to John, he might have been a brother, older brother, cousin, uncle, father or grandfather. For me and, I suspect, others in the late '60s cohort, he was (quite accurately) a father figure. That implies a lot of things, including rebellion on the part of the "offspring". Actually, a Division manager was heard to say, even 20 years ago, that "We needed to quit relying so much on Googin to get things done". Putting those two things together means that I spent less time seeking his advice than I should in my early days, only in later years wising up. That is a lesson for everyone - always learn from and test yourself against the best, and you will grow faster.

If I were trying to blend up John Googin from parts of other people, I would take liberal doses of Ben Franklin, Sherlock Holmes, Thomas Edison, Dick Feynman and Harry Truman.

Everyone that knew John had a host of stories. I'll share a few.

Lots of young people destined for technological careers make explosives, usually gunpowder or one of its variations. John was a bit more sophisticated. It was his job as a young man to feed his family's coal furnace, which gave him the opportunity to experiment with techniques to generate CO-air mixtures that could be detonated. Apparently he woke up his family this way several times.

John earned his PhD in physical chemistry at UT while working at Y-12, something a number of people have done since. However, no one since has done it in quite his way. While taking one of his graduate courses, he was so vocal in class that his exasperated professor challenged him to teach the class himself, if he knew so much. And that's exactly what he did for the rest of the quarter.



John was heavily involved in the engineering of the facilities built in Y-12 for the separation of Li isotopes, especially the COLEX process. It was certain data published in the open literature by (ironically) Soviets that gave him confidence that the approach he favored would work. Knowing how he learned lessons from each experience and built on them, it may have been that experience that led to his later interest in OPSEC and protection of information from use by potential adversaries.

Most know of his joy in working with machines of various kinds (in fact, he probably regarded all of nature as one big machine). I remember him demonstrating his collection of miniature cameras to the Carbide Camera Club - the smallest was a Minox spy camer a and the largest was a half-frame Olympus. He was also famous for running through generations of computers - but his most powerful computer was not the digital models on his desk, lap, or in his pocket, but the analog computer in his head. That leads to an illustration. After working through the pilot scale, the COLEX process was being set up in earnest. It was a very complex chemical engineering system, and one group of cascades was still not in balance after two weeks of fiddling. Bruce Hale was in the control room attending to the multitude of gauges monitoring the process, and John ambled in. He began to slowly walk down the line of gauges; when he reached the end, he slowly walked back. He told Bruce, "Adjust the first column in the last cascade", and walked out. After a short time, that adjustment worked and the system came into balance. That kind of intuition served him well all during his life.

Sometime during the '50s, Y-12 Development and an unnamed large private corporation (LPC) had a cooperative arrangement to work on a large AEC program. A visit by certain gurus of the LPC occurred, and lasted into a second day.

On the first day, the LPC's gurus apparently made a snap judgement of John, found him not worthy of their attention, and in fact were quite rude to him (this was pre-orthodonture and before his reputation had spread enough to give him the "aura" that he had later). Taking umbrage at this cavalier treatment, he prepared himself, and the next day cut them off at the knees, chewed them up and spit them out before they knew what hit them. This was unusual for him, however. He would criticize technological error, and was also ready to criticize programmatic inertia, but it was almost invariably done in a constructive way.

The late '60s saw Y-12's involvement in fabricating equipment to collect samples from the Earth's moon. There were several engineering considerations, especially lightness and inertness, involved in the design and choice of materials. Both the tools for collecting specimens and the vacuum-sealed box for returning them from the moon had to be free of living organisms and as free of organic material as possible, in order to answer the question about life on the moon. John was deeply involved in defining the problem, the criteria that cleaning had to meet, and the methods used to clean the things. The (in)famous Roger Liddle had the job to set up the cleaning facility (using a laminar-flow clean room, the ruin of which is still in the center of Rm. 270). This required working with other organizations in the Plant, and at one point one of the key individuals in one of those organizations was being obstinate about doing things "right". At a meeting between Googin, Liddle and this person, it became clear that no budging was going to happen. John then got the attention of the Division Director's secretary, Betty Whitehorn as I remember, and said, "Betty, get me the President." Betty asked, "You mean Roger Hibbs?" John answered, "No, I mean President Nixon", and continued with some statement about the moon mission not going forward without doing things right. The other person in the room became very cooperative.

I remember the early '70s era of public debate about ABM's - whether they would be effective, and their legality in light of existing treaties. One such debate occurred in Oak Ridge, with hundreds in attendance. I don't remember who the principals were, but the moderator was John Googin. The main thing that stays with me is the irony that the moderator could probably have replaced both principals - he could have debated himself - and probably more light could have been shed.

Shortly after the shooting down of the Korean Airliner, John and I were both at the library. I noticed that he was looking at a map of the Soviet Union, and asked him if he was looking for where the incident took place. He said, "No, I'm looking at where the orders came from (around Moscow)." I didn't know if that was for his own curiosity, or if he was doing his intelligence analysis thing.

John was very involved in all issues of security, and was a part of the Y-12 Emergency Operations Center (EOC) team. Years ago, one of the pilot uses of artificial intelligence technology was to try to capture his expertise in this area, creating the Emergency Response Advisor, or ERAD. I quote from a previous issue of FYI:

One may wonder about the regard in which ERAD is held by those familiar with the effort. Sentiments regarding ERAD are expressed most prevalently by two fears: 1) that the resulting system will not reflect adequately the inferential processes that Dr. Googin employs, and 2) that the resulting system will reflect too adequately the inferential processes that Dr. Googin employs.

John with the gang of four.

Emergency operations is yet another area in which personnel are subject to training. Training materials are typically impersonal, and this is no exception. However, the only person accorded the honor of specific mention in those training materials for the EOC was Dr. Googin.

Before we began to get John's Manhattan Project memoirs on paper, he did a few talks to the Division on the same subject. I remember one in which he compared himself, as a "outspoken liberal" type, to Andrei Sakharov, who you may remember got into a bit of trouble in his society for criticizing the "system". At the time, it seemed like a slightly cheeky bit of self-aggrandizement, but as usual he was just being accurate.

John had a highly-developed (but not bawdy) sense of humor, and an extremely distinctive and infectious laugh. He had a serenity that only those really secure in themselves ever get. That kind of security is very rare, and in his case stemmed from extremely hard work over a long period of time by a brilliant individual. That long period of time is even longer when you consider that his acknowledged ability to get along on 4 hours less sleep per night than the average person gave him about 10 more years to work with.

Bob Reiner, Mike Baker and I were at a meeting with John and other corporate luminaries on the Friday before he died. The meeting concerned a project for setting up a recycle process somewhere on the Oak Ridge reservation, based on a new company's innovative technology. He was his usual self, affable yet probing here and advising there. His zeal for promoting diversity has been mentioned elsewhere; on this date he took pains to complement a presentation done at a previous meeting by a young female engineer of the new company. When a question came up about the boiling point of technetium, John simply took out his pocket computer and a few keystrokes later had the answer.

Wes Smith called me with the news of John's death, and pointed out that his career had "bookended" the era of the use of nuclear power as a principal component in national defense. The way that John summed it up (from the interview for the award given by Chemical Engineering magazine) was as follows:

"Careerwise, I've been one of the luckiest persons I know. It is hard to beat deciding in high school to prepare for a possible future in atomic energy, doing that through college while the national effort became secret, selecting by chance a job offer from the Manhattan Project, and being assigned to a job that matched my speculative background almost perfectly. One of my great good fortunes was early success. It appears hard to overcome either a good or a bad reputation."

Goodbye, John.

Jonathan S. Bullock

John Googin walked into my life only a few days after I came to work at Y-12 and stayed a part of it even after I retired. We traveled together often and worked together on many projects. We were active in the same church, and he was campaign manager for me when I first ran (successfully) for the Anderson County Commission. We belonged to a couples supper club together, although he was far more interested in the discussions afterward than the food. he introduced me to frog's legs on one trip and to Edward Teller on another. He was a good sounding board for ideas and problems, although he was practiced at taking the opposite side, so that you were not always sure what he truly believed. No one was about to intimidate him, regardless. He took on the LLNL management on more than one occasion, and took on the local Ross Perot Group during one of our last encounters, a debate over the merits of NAFTA. I remember telling a Union Carbide top manager, at the time they were discussing assigning him to a corporate position, that Y-12 Development was not ready to function without his participation. Perhaps it never will be. *Robert B. Burditt*

Of the many things for which I deeply respected Dr. Googin I believe that it was the commitment he held to the philosophy of deterrence for which I most admired him and which does great honor to his memory. Never one to shy from a belief which he held, while many of the notable scientists, including many involved in the Manhattan Project, had come to denounce the nuclear policies of this country, Dr. Googin seemed to truly embrace the necessity of maintaining a national position of strength and he contributed mightily to the achievement of that end. Fifty years of relative peace and the events in Eastern Europe over the last few years speak well for the wisdom of his position.

A great intellect and a kind and gregarious man, Dr. Googin will be sorely missed by the nation which he devoted his professional life to and those who had the privilege of knowing and working with him. No eulogy could possibly do justice to his accomplishments or personality, it is perhaps best to say only that we as individuals and as a nation are greatly diminished by his passing.

Post Script:

Over the last several years I had the privilege of arranging several tours and lectures in which Dr. Googin at the same time educated and charmed us with his wit and wisdom. Several of these events were committed to tape and are, or soon will be, available for viewing. The oldest series of tapes dates from 1989 and pertains to weapons theory, while a more recent (1991) lecture series on weapons materials was also taped and is available; we hope to have all of these tapes "enhanced" professionally. Dr. Googin had recently completed a lecture/tour video which encompasses the Plant's enriched uranium operations. The editing process on this video is now near completion. The opportunities for the planned lecture/tour videos of lithium operations and other topics are now sadly lost forever - my fault for not seizing the opportunities more quickly. I strongly encourage anyone who is currently, or plans to be, involved in weapons work to take the time to view these tapes; it will be time well spent. *Edward Churnetski*

In Reminiscence

I will really miss Dr. John Googin (affectionately called "Googin" by so many of us) as I have known him and been associated with him since my early days in Y-12 (June 1945). I found him to be a very, good and lasting friend-always true and caring. He was a gentleman you could rely on and one who did not try to push his beliefs on you. Both a serious and a lighthearted individual, he believed in one doing what was right and having laughter along life's way.

In the early days of Oak Ridge the population consisted of more people on the younger side. To many of us, you were on the older side if you were past the age of 35. So many events were planned in groups for entertainment for all ages in this "new world" and to make it possible to meet people from all over the United States. Such events as this included John when he was not working.

When I first transferred to the Development Division in its early years, I worked as secretary to a department divided between Fundamental Studies and Aspen Development (headed by John M. Googin and Harvey W. Saylor). John always did most of the basic typing for his reports so that did not leave much for me to do-always said that one could not read his writing. Mr. Saylor planned to take retirement about the time the division was expanding and progress was on its way. I was given a choice of staying with Googin's department or going with Paul Wilkinson who was to be supervisor over a new Metallurgy Department. To me at that time, the metallurgical "words" were more understandable than the chemical ones and the work load was very heavy, which I liked. Though I had much admiration and respect for John, I chose the metallurgical development, and have been here since then. I think the only remaining employee in Development who worked under Googin and Saylor is Ray Waldrop of the Chemistry and Chemical Engineering Department. Then when I left, Cleo Sideris came to work with John's group.

Recent company service anniversary.

The Development Division has been made up of so many individuals of various backgrounds and degrees of education and has always been a most interesting

place to work. I have worked with many of them, but John was outstanding. We all worked so hard and together, sharing and caring. "Working with Others" was already instilled in us.

Whenever an occasion arose where contributions were needed for a worthy cause, John was one of the first to contribute and gave most generously. He often asked what Development was going to do before anyone came to him.

John was a very devoted family man. He often referred to his "girls", and his wife, the former Janet Horn who worked as a medical technician in Y-12 when they met and who was his main girl. He enjoyed family activities. Once while doing the "twist" with one of his daughters a little accident resulted in a broken or fractured foot for him.

At quitting time on Thursday afternoon before his death on Sunday, Dick Bell, John, and I were talking in Bell's office. The conversation involved changes noted. I am happy that the last things I said to Googin were things he already had heard but appropriate to the conversation. I told him he was one of a kind and I would always remember how he treated the little man the same as the big one in any dealings, and that one thing in his character would always stand out, his honesty and sincerity, something that is rare. Then in his usual witty way he said, "Helen, I remember when you had toe trouble."

An interior designer would have "gotten lost" in his office. A photograph should have been taken of his office before the "dismantling of documents" took place. To those who knew him, you knew that immediately he could put his finger on any one item of interest that could be in the mighty and high stack of papers, reports, magazines, and books on his tables and desk as well as the exact location in his classified file. Some have said that the unclassified collection he left was a treasure. Who knows what his latest document or documents in preparation may contain.

The Oak Ridge Y-12 Plant has been fortunate to have had a man named John Melvin Googin who shouldered much responsibility, used his vast knowledge and scientific expertise, used his down-to-earth reasoning and understanding, was a dedicated and loyal American citizen, who always had a ready smile, and who helped his fellow man on the local, national, and international levels. WE OWE HIM A LOT. *Helen M. Claffey*

Googin's ability to ask the wrong question at the right time, The Googin Mystique.

Dr. John's position at the center of many human networks, John's willingness to help others in both technical and personal areas, his sense of humor and irony,

But I come up short.

I have thought about telling an anecdote:

The time I had to cleanse his office of radioactive materials due to ALARA. I waited till he was gone and did the deed but he didn't speak to me for some time.

His love for chocolate so much that he would take a spoon of unsweetened cocoa and a spoon of sugar together.

The many times I received counsel both personal and professional.

Most of the stories I would choose to be personal and private memories of a friend and mentor.

Our loss is like having a stroke. It will likely affect our speech and thought processes for a while, there may even be some paralysis, but with the proper therapy and a lot of work on our part, we have a chance of getting back close to what we were before. *Cameron Coates*

People will miss seeing Dr. Googin around lunchtime at the "coffee station" where he was popping his popcorn or microwaving his instant oatmeal, always with a pleasant word for anyone there or passing by. *Walter Corbett*

When I came to Union Carbide in 1969, I did not immediately have personal dealings with John Googin. I would see him at division meetings and plant-level meetings, where he would always sit up front and ask odd and sometimes embarrassing questions of the speakers. "Who is this funny, quirky little man," I thought, "and what is his function?" Being young and brash, I did not recognize stature when it was in front of me. Believe me, I certainly have come to a better understanding!

It was hard to tell where John Googin left off and the Y-12 Plant began, as close and intertwined were their fortunes. Surely, no single person can claim more personal credit than John Googin for the success of Y-12 operations. Several of the absolutely central processes have John's indelible mark upon them. Certainly, no one enjoyed their work more. I asked him once if he had ever considered retiring, and he said "Why should I? I have a $5 billion toy to play with!"

Being involved, as he was, from the absolute beginning, it was as if John had been born especially to perform his role. If not, Fate certainly delivered up a monumental coincidence. If so, on the other had, I cannot help but believe that world events caused John to see at a deep psychological level that his work was finished, that he had succeeded, that he could move on. Perhaps we shall see him in another life. I hope so. *Clyde Davenport*

We had a short conversation that impressed me so much, soon after I met him. At some point in the day I realized that for a better part of that day Dr. Googin had been pacing the main hallway in 9202, with his familiar shuffle-walk and his no-melody, off-keyed whistling filling the empty crevasses that regular office noises leave void.

When it occurred to me that he'd been in this mode for quite some time I went to the door of my office and stood waiting for him to saunter back my way. "Excuse me Dr. Googin," I said, "you've been pacing this hall almost all day now and I'm wondering what's wrong; are you concerned about how broken that whistle of yours sounds or is something more serious bothering you?" Dr. Googin first responded with his familiar laugh and then said "I'm pondering a project some of my scientists are working on right now. I know what the immediate effects will be, and say, 5 years down the road, but what will the effects be in say, 20 years, or 50 years."

(I often think how presumptuous I was to think I could interrupt such an important person with such a fresh question. Each day I learned more of his worldly prominence and personal capabilities and yet he never appeared to be too busy to deal with mere mortals like me (and many others) out of his daily life, but instead he walked my walk and often shared my concerns and troubles. Which leads to another comment.

"Gordon, if this is the only salary increase I get this year, then go ahead and give it to me!"

Several years ago a single-parent stopped in Dr. Googin's office to chat. Controlling teenage children was a current problem for this parent. Even restricting the use of the telephone seemed like an impossible task. Dr. Googin's response to the parent's declared frustration was to ask 'How many phones do you have at home?' After being told how many, Dr. Googin said "Your problem is that you have too many phones. When my girls were at home, you know how many phones we had in our house? ... one ... and you know where it was ?... right next to my easy chair. I never had to worry about them being on the phone too long or making plans I'd not approve of." (Wasn't that bit of common sense just pure genius?) *Jean M. Deakin*

This is a small sample of my personal impressions of a brilliant scientist and wonderful human being, John Googin.

I came to the Development Division in 1966, and instantly it was obvious that Dr. Googin was the person who could help the average layman as well as be a source of information for young scientists entering the work force. He was already a leader in the scientific community. He would listen, he could direct, he knew avenues of research and development that needed attention, and he had plans for himself, for the division, for the company. He was an achiever.

On top of being an internationally known scientist, Dr. Googin had so much compassion for his fellow man. He never forgot a conversation he may have had with a coworker regarding a personal situation. Anytime he saw you he would ask "how is that young man doing?" or whatever the circumstances.

To sum up my feelings for this wonderful person, "I am always grieved when a man of real talent dies, for the world needs such men more than heaven does." This came from George Christoph Lichtenberg, but it certainly is my personal feeling for Dr. John Googin. *Evelyn Dixon*

John treated all people equally as human beings and all needing respect and your attention. I guess he did this all his life even before it was the thing to do. I remember one instance, probably in the middle 50s, when this was demonstrated to me and certainly when it was not necessarily the thing to do, especially in the Deep South.

Several of us had been to Los Alamos and on our way back to Oak Ridge we got weathered in in Dallas. Some of us wanted to get on back as soon as we could and learned that the train would probably do that (I'm sure we all remember the days of passenger trains). So we "taxied" over to the train station, got tickets, and headed home. We had a few

hours layover in New Orleans and while in the train station we needed to make a rest stop. In those days there were restrooms for "colored" and "white". We located the "colored" first and had not found the "white", so John reached for the "colored". The others of us questioned this approach. John's response was if it is good enough for them it is good enough for him and headed on in. The others of us reluctantly followed. We took care of our business without incident.

In John's later years as we submitted his name and accomplishments for several awards within the company as well as outside, John in his usual manner would accuse us of giving or getting him another award rather than giving him the salary increase he deserved.

I never really figured out how to do John's performance appraisal each year. This was for several reasons. First, can you image trying to set out some goals and action plans for John? Second, even when I did try to do a performance appraisal for him I wouldn't get more than two words out of my mouth before John would start doing my performance appraisal, as well as all the management levels above me. John usually let us know pretty well where we had fallen short of what we should have achieved. Regardless of whether I even did John's performance appraisal we would always have a good chat and I would go away knowing some things I should do differently.

Doors to offices or secretaries in outer offices never meant much to John when he felt something was going on in that office in which he could provide some input, he just came on in and within a short while was in control of the discussion or meeting. I suspect whoever is over the great beyond wherever John has gone has learned all of these same things in the short time John has been there. The human race will be a little less without him.

William H. (Bill) Dodson

Dr. John Googin: Why His Career, and Life, Were so Singularly Successful

Over and above any other considerations, Dr. Googin was quite a lot smarter than most of us. As a student of the statistical behavior of ensembles, he would have rejected the idea that he differed qualitatively from his contemporaries, and preferred to think of human intelligence as being distributed along a Gaussian (bell-shaped) curve. In this frame of reference, he was somewhere down on the lower right-hand part of the graph, where the spacing between the curve and the horizontal axis of the graph are hard to resolve. Googin was a remarkably rapid learner. He could come up to speed in a new technology area in the space of a few days. He had the methodical, analytical mind required of a physical scientist. He was a very innovative person. These attributes were coupled with a level of retention, or recall, that few of us have encountered in others.

Oak Ridge is full of geniuses. A second attribute that set Dr. Googin apart from the multitudes was his affinity for hard work. He could survive (or thrive) for months at a time on four hours sleep per night, while spending the remainder of his time on a high-pressure technical problem, and seemed able to give the effort his constant, intense concentration.

John Googin personified confidence. If ever a song were written that seemed to describe his style it would be a show tune from the Musical, "Annie Get Your Gun", titled "Anything you can do, I can do better". This confidence extended beyond his own abilities to include the members of his working groups. This positive way of thinking tended to draw-out the best efforts from the other members of his organization(s).

Dr. Googin's forensic skills were widely known. He employed several intricate strategies that served to identify relevant issues and expose the strengths and weaknesses of the arguments being put forth, not to mention how carefully these arguments had been prepared and examined. This was all done with remarkable quickness, often leaving his opponents thoroughly bewildered. Probably the most significant result of this practice was that Dr. Googin's colleagues learned to think carefully how best to defend their programs, proposals, and technical arguments. One additional aspect of John Googin's life that influenced many of us was his commitment to human equality. He was ready and willing to communicate with anybody about any thing at any time. Dr. Googin had excellent listening skills, and laborers, clerical personnel, technicians, and novice engineers considered him much more accessible than their line managers. At the same time, he was not intimidated by rank, power, reputation, or bluster. He was a friend, mentor, advisor to racial minorities and women who were willing to challenge the power structure long before this was an expedient thing to do.

Walter K. Duerksen

How fortunate for us all that this one in a million individual would find a one in a million opportunity, created by the need to rapidly establish a nuclear weapons system for the Nation and to continually improve it over the next five decades to meet the challenges of the Cold War. When we look back at the crucial role the Y-12 Plant has served, we find John was at the heart of almost all those major contributions, inventing ways to do some difficult chemical task or to solve some urgent problem nobody else had been able to solve and then tackling the fearsome task of scaling the process up to a production scale.

These successes have been major Y-12 Plant contributions to our National Defense, the success of which depended to a great extent on John's figuring out the chemistry or physics, then telling us how to build the equipment, showing us how to start it up and operate it safely, then trouble shooting the inevitable operating problems. But these half-dozen outstanding contributions doesn't begin to describe John's career. It can't begin to do justice to the hundreds of other problems people ran to him with each and every year, nor to the thousands of times he walked around the labs he loved to visit to see what was going on and to help young technical people with his trademark and miserably difficult questions, such as, "Now just what does all this you're doing mean?"

*Now when **we** turn and ask **his** question about **his** life: "Now just what does all this you've done mean?", looking back at his long and distinguished career we are awed by the **value that he added** to the Y-12 Plant, to the nuclear weapons complex, to the National Defense System, to the space program, to the civilian economy, to our nation's intelligence, non-proliferation, and international security programs. Even more do we treasure what he added to the personal lives of those of us who had the high privilege of working alongside this warm, humane, **genius** who did so much for us.*

Gordon G. Fee

"Now that you've given me this thing, let me tell you what I think about..."

Probably the most notable thing about John Googin was that it didn't matter to him if you were a PhD or a janitor. He would talk to you as a human being regardless of your education or where you were on the social ladder. As a maintenance person (electrician) I noticed this the first time that I met him. I was either repairing his lights or checking power cords in his office and he talked to me as if I was an old friend. This is echoed by many in the Maintenance Department. Of the many comments that I've heard, this stands out. He didn't cull people out based upon what they did or how much an hour they made. He never allowed his education or position here at Y-12 or even the numerous awards that he had won to put himself above anyone.

Of course we'll always remember his laugh and his old sport coat and worn out shoes. No dress up for him. He was always in good humor with a twinkle in his eyes and a good word for everyone.

Someone asked him several years ago when he was going to retire. He laughed and replied "Where else can I have as much fun as I do here?!" And so we had the pleasure of knowing him and benefiting from his knowledge and leadership far beyond retirement age. We'll all miss him and all our lives are richer for having known him. We have to say good-bye, but we won't forget.

Lynn E. Griffin

Back in the early 1980s, Bill Griffith, Alicia Compere, and Jack Cunningham got together to sign John up for some awards. In order to get the awards, they had to put together a group of testimonials and exhibits that made the most of whatever John chose to offer. Bill had known John for a fair number of years and was amused. Alicia, on the other hand, was trying to figure out what John was, what he did, and why it was useful or important. After a while, they'd pulled together most of the pieces they needed - phone numbers, people's names, patents and disclosures.

After calling fifty people, they had fifty very different stories about forty different projects. None of it matched, and Alicia couldn't make much sense out of it. (Bill, having been at Y-12 for a long time, of course, knew better.)

After a while, with a chuckle, John said, "That's what I do, it's been documented." Being John, he didn't say where it had been documented, just that it had. Apparently figuring out what John did, and how he did it, was an old Y-12 problem.

After a long dig, they found a copy of Joe Williams report on "Evaluating John Googin's Value to Y-12," written in 1966. Having tried a dozen different ways to evaluate Googin, Joe finally got the Y-12 staff to list how different projects used his time and energy. Joe got back so many different responses that he finally had to have them keypunched and computer sorted. In 1966, a recession year with a massive staff layoff, John "fixed" technical problems in fourteen key projects, and, as well as can be estimated from the keypunch lists, "dabbled" in over 200. Other years were a lot busier.

Joe Williams' summary said - and says - it best.

Bill Griffith and Alicia Compere

UNION CARBIDE

INTERNAL CORRESPONDENCE

NUCLEAR DIVISION

POST OFFICE BOX Y, OAK RIDGE, TENNESSEE 37831

To (Name) Mr. W. K. Whitson, Jr.

Company

Location Building 9202

Copy to File (NoY-12RC)

Date February 7, 1966

Originating Dept.

Answering letter date

Subject Study on Dr. Googin

When you first asked me to get together some information on John Googin which might be of benefit in evaluating his value to Y-12, I was not very enthusiastic about the assignment. In the first place, I figured that anybody who worked in Y-12 and didn't have such an evaluation in his own mind was, to say the least, unperceptive. Secondly, I felt that John is loud enough, imperious enough, and aggressive enough to state his own case.

Finally, I just didn't know how to go about doing it . Googin has too many facets, some of them controversial - most of them complex, to allow any sort of simple analysis. I talked with some people and I thought a lot, and finally as sort of a negative answer to my problem, I decided to question a sample of his colleagues.

As it stands now, I'm glad I did, and furthermore I'm glad I had the assignment. I feel that an excellent picture of Googin has been laboriously drawn by the sum total of the answers I got. The picture had some surprises for me, and I think it will for you, also. I still think it is not possible to draw the picture in a few words — you have to study the data and the substance of many individual statements to get it. I can, however, tell you of some of my conclusions, all of which are open for argument, and they are as follows:

1) It seems I have always known that Googin has great breadth. One surprise was to find that his depth, in both facts and understanding throughout this great breadth, is equally impressive.

2) His capacity for accepting a great number of consulting contacts and his high percentage of specific and immediately applicable answers is larger that I had given him credit for.

3) Too many people use Googin for a crutch to avoid the unappetizing parts of research such as literature searches. They also use his consultation instead of their own guts to bolster their conclusions.

4) Googin's dollar value to the plant is hard to estimate, primarily because he participates in such a variety of projects. The questions revealed his batting average and his involvement in important decisions to be so high, however, that we are forced to talk in at least six digit numbers per year.

5) I believe that most of the people questioned were shocked to be forced to consider how to get along without Googin. His value seems to have been taken for granted, but essentially every respondent expressed deep concern at the thought of not having him available.

6) My final conclusion is that there are some things the plant ought to do to maximize his value. I think they are as follows:

   a) Encourage wider use of his consultation services. At present 30% of development's engineers have no contact, while the remaining 70% may contact him too often (see item 3).

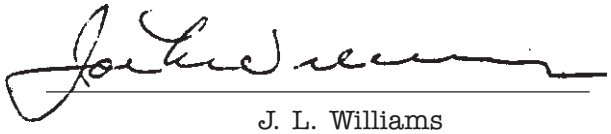
   b) Attempt to minimize John's participation in administrative contacts. Almost 15% of his consultation time appears to be taken up with administrative discussions, and a surprising 21% with philosophical matters, many of which probably pertain to non-technical subjects.

   c) Formulate and activate specific plans for insurance to cover the possibility of the plant losing Googin.

   d) Provide whatever incentive is necessary to keep him here and to keep him interested and active.

   e) Encourage more use of his services on long-range planning. If possible, provide a more comprehensive method for formalizing this planning so that is can receive deeper consideration. At present it appears that about 23% of John's consultation time is consumed in dealing with minor technical matters. In my opinion, this is highly wasteful.

Details on the study follow.



J. L. Williams

JLW:nw

Two humorous (at least to me) incidents concerning Dr. John came to mind immediately.

The first occurred in 1961 when any absences were still scrutinized rather carefully, and vacation granted left much to be desired. I had just become eligible for three weeks vacation and wanted to go to Europe. I felt like I needed more time. John was at the time my department head, and I approached him on the subject. He commented, "Rules are made to be broken or find exceptions to. Let's see what we can do."

Without consulting anyone, he told me to work ten Saturdays, and he would give me ten extra days. I did so; and shortly before departing, I discovered I needed another part of a day to make proper plane connections in New York. John solved this one by telling me to be sure the plane flew over the New York Public Library so he could simply say that I had gone to the library.

All went well, but I understand that Timekeeping had trouble with those ten days for many months. I don't know what the outcome was.

The second amusing incident occurred when I was getting my MS. John and three UT professors comprised my committee. The day came for my oral, and the three UT profs set in on me with many questions. John would chime in once in a while. After just a few "chime ins", the profs seemed to lose all interest in me and talked about an hour with John while I sat in the corner away from the crowd, so to speak. With very little input at the oral on my part, they decided my thesis was quite satisfactory and I received the MS. *William L. Harper*

When I was in Development in 9203 and Dr. Googin came by my office, he always stopped to chat for a minute or two about his grandchildren and was always kind enough to ask about my children. I think that is one thing I will never forget about him; he was very personable and never too busy to say hello. *Mary Henley*

I knew Dr. John M. Googin for nearly twenty-seven years. My memories of him are as an extremely smart, friendly man, who genuinely cared about science and Y-12. I never saw him get mad. He never forgot anything, and gently prodded researchers to put out their best. My wife and I were fortunate enough to have met him several times at occasions outside of work.

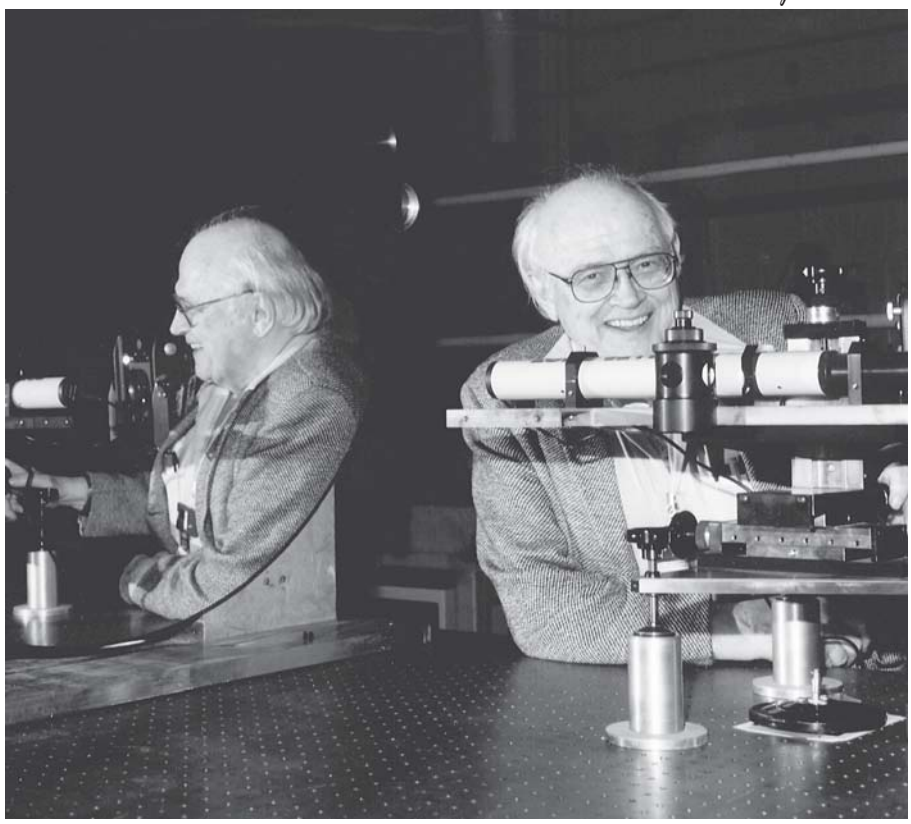
Often, he had his camera and took many pictures — one trademark of his out-of-plant personality.

Dr. Googin was a mentor for me and many others. His jesting, "What have you done for me [Y-12] today?," was meant to spur you on. And, for me, it did. Once, to my wife's surprise, he even used that line when I was looking at some small computers at Service Merchandise.

One interesting thing he told at dinner was that, when he became engaged, he was regularly working with mercury, so he had to ask for a wedding ring of platinum to avoid having the normal gold ring disappear as an amalgam.

His legacy to many of us is our drive to do our best and strive to pursue the unknowns in science. He will always be remembered, and his memory may make us all be willing to state our case as he did (debate strongly) and not just watch things go by. *Cressie Holcombe*

Two of the many sides of the man.



In the course of our key personnel review and development process, we have asked ourselves how John has been able to make so many significant contributions in so many different areas. We have also asked ourselves how we could develop individuals who could operate as internal consultants and collaborators as effectively as John has.

It is not so difficult to recognize the qualities and ingredients of John's effectiveness. It is indeed very difficult to find even combinations of individuals who could step into John's role and make equal contributions.

I believe most of John's friends and John himself will agree with me that it is not unusual charms and graces which make him so effective, but rather the unique combination of his broad interests, his quick grasp, and—by now—his extensive experiences and competencies in the conceptual, as well as applications, areas. It is the fact that he is so frequently able to convince key individuals of the correctness and soundness of his evaluations and recommendations. Open-minded and change-minded individuals will agree with him most quickly. More defensive individuals will first get upset before they, too, will let themselves be receptive to his positions. In our age of specialization, when the planning of advanced technical programs requires some consensus and sharing between the conceptual and the applications groups, John can be equally effective with both types. It is therefore difficult for defensive dissenters to find refuge in any area in which he may not be knowledgeable and conversant.

Although John does not avoid dissent or controversy when he feels that progress might be impeded, he is basically a very positive and constructive individual. He is also very interested in the interfaces of technology with social, economic, ethical and political issues. *Clyde C. Hopkins*
(from the nomination for Chemical Engineering Magazine's Personal Achievement Award, 1982)

*...although Teller may have been the **father** of the hydrogen bomb, John Googin certainly qualifies as one of the attending obstetricians.*

...he is essentially self-taught and more importantly continues to be self-teaching.

...he has an incredible grasp of the physical world. I don't know anyone who understands as well as he does what molecules or isotopes go through when they are separated from other molecules and isotopes. It's almost as if he could shrink himself down to size and see and feel what is going on at that level.

...he does not hide in an ivory tower. He gets his hands dirty, burns holes in his trousers, and whenever possible, uses the production plant as his laboratory. He has been able to do that because he is an extrovert who has mastered the

art of directing all manner of people without giving them orders. He is, in turn, preacher, teacher, gadfly, thorn in the side, catalyst, and he gets his way most of the time.

Unfortunately, because his understanding has been so thorough, he has occasionally been know to tell the weapons designers either how to design their wares or why a certain idea of theirs was not the brightest one he'd ever heard. That has not caused much amusement either, and John being right, at least some of the time, has not made matters any easier.

There is an anecdote about Admiral Ernest King, who was appointed Commander of the U.S. Atlantic Fleet at the beginning of World War II. Admiral King was not a very loveable fellow. So, when he was given that job his comment was "when they get in trouble, they call in the SOB's" Don't gasp! I just want to paraphrase. There is an unspoken saying that has been applicable at the Y-12 Plant for a long time and it goes something like this: "when Y-12 gets in trouble, they always call in Googin." What difference has he made? Let me put it this way: For almost forty years, John Googin has touched many, many people with his magic wand, and that includes everyone that counted at Y-12 and many outside Y-12. Most have been bettered by the touch; and, as a result, a ragtag band of rather ordinary people have achieved some rather extraordinary things in support of some very important national programs. *George R. Jasny*

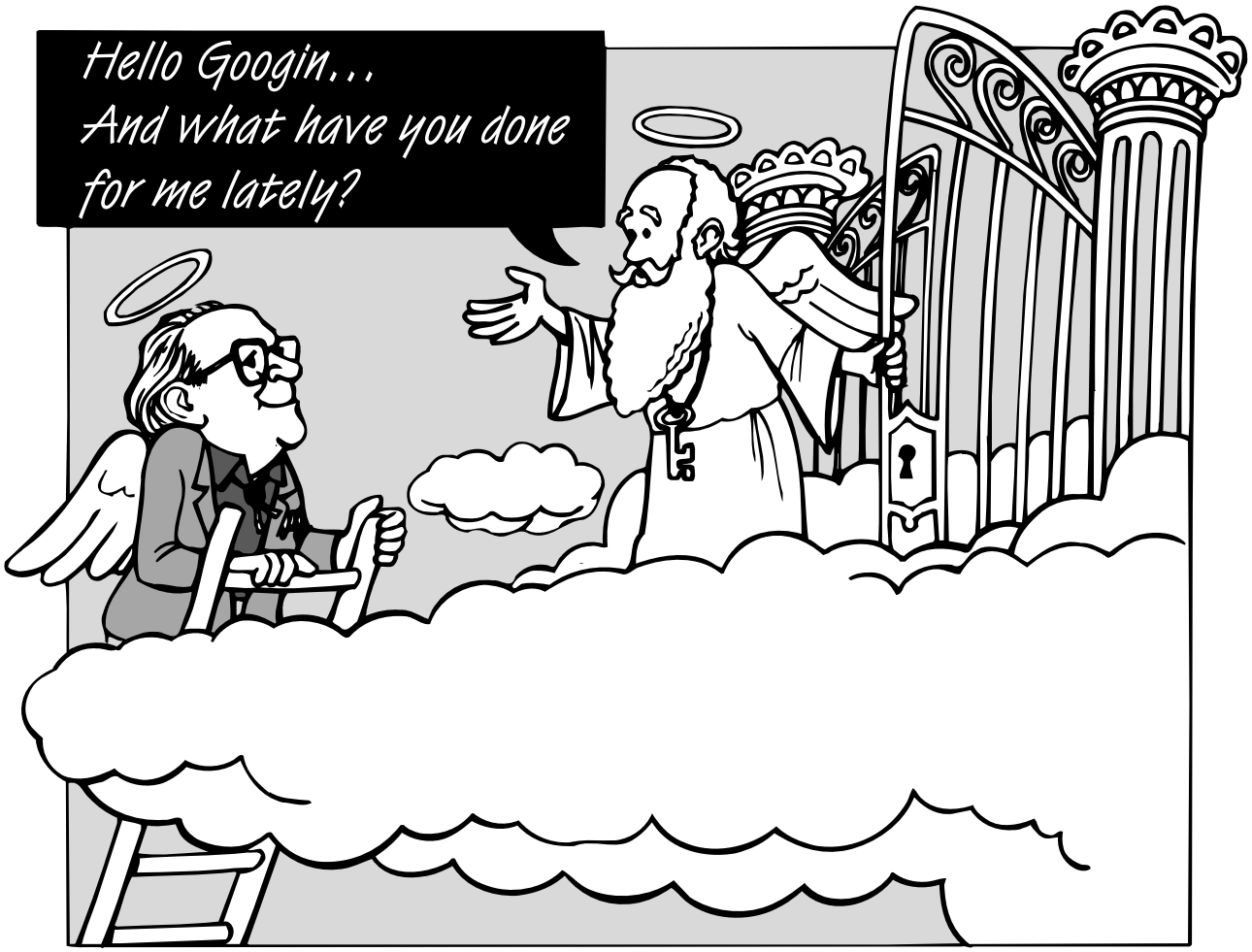
(from a testimonial in honor of the Chemical Engineering Magazine's Personal Achievement Award, 1982)

Dr. Googin was really nice. I didn't mind talking to him on my level. He talked to me on his level and I talked to him on my level and we had a good understanding of each other. *A. D. Johnson, Janitor 9202*

Dr. John

It was my good fortune to have Dr. John as a friend, professional advisor, critic of my deferred technical approaches, visionary, supervisor, and as a next door office neighbor. Dr. John...always a friendly greeting, always inquisitive, always sharing a challenge, always available to advise, always a keen wit, always had time for any of us, always the same to all of us, always had an opinion on political subjects, always had technical insight beyond most of us, always would share his popcorn, and always asked at the end of the day, "What have you done for me today?"

Dr. John and I had adjoining offices during the past eight years, and I always marveled at his ability to stimulate whoever entered his office, or happened to catch his attention when walking down the hallway. The development staff knew that to pass his way could well mean an oral examination on your project. Those in the back part of 9202, when they didn't think they could spare 20-30 minutes for a discussion, would use the "Googin By-Pass" through the Met Lab (before RAD areas). I have seen him impart the same oral examination on Division Managers, Plant Managers, and Vice Presidents. The intensity would vary, depending on your level of experience. I enjoyed his frequent visits to my office, and you could bet he would always have a challenging issue on technical questions about a project he was interested in. You had better have a reasonable answer or hope that one of the Development staff would pass the door way and Dr. John would suddenly become interested in their project. Lamar Royer was always my favorite, because Dr. John seemed to



gain major enjoyment in giving him the oral examination. I miss him greatly, but he would say "What are you going to do for me today?" *Fred Jones*

I remember an episode sometime in the late '70s when a young engineer was in conference with John, trying to sell him on a new project. The engineer was taking a position which you might describe as "left field", so John was being the devil's advocate and taking "right field" to pull the engineer toward "center field" (a correct position). At some point, the engineer's position moved past center toward John's position. John then shifted his position cross-field, between center and left field, to pull the engineer back toward the center again (it worked). I'm not sure if the engineer ever realized exactly what happened. *Harvey T. Kite*

Written in appreciation of Dr. Googin

To a few you are a tyrant
With a heavy handed touch
With a grip of a bulldog
And opinions over much
A citadel of office books
Surround your computered room
Sometimes in your pronouncements
I see Ralph Nader with a broom
Usually, though, you'll simply say
"Don't repeat the jaded past"
"The library's just over there
A hundred experts it you'd ask
But to the one who could use some help,
You offer a guiding hand
You are the one who listens
No matter your other demands
For you always take the time
To inspire, direct and teach
On subjects without bond
To any who would seek
Perhaps your most lasting accomplishment
Will not be the things that you said
But rather the fruits of your listening
Will bear in the action of others instead
A sounding board for all ideas,
Genius as well as pranks
From all like us who value your gift
Our never ending thanks
We can only give a memory
When all is said and done
All goals in life are fleeting
That is, all save one
Countless times whether won or lost
In delight or utter despair
It's the memories of how we've lived
And whether anyone cared
I have a memory of a teacher
Who listened wise and strong
And helped to make a better world
And if I listened, helped me along
Yes now he is only a Memory
A powerful purpose complete
For many he taught the keys to success
And how to accept defeat

Dean K. Little

One of the most fascinating days I have had at work during the last 13 years was the day I attended a tour of the Calutrons in Beta-3 given by Dr. Googin. The tour group was very small and we were able to ask a lot of questions and discuss a wide range of things that day…details about how equipment and materials were handled, about the spy that was uncovered working in 9212, social activities during the war effort days, how he (Dr. Googin) got his wife to agree to buy him a platinum wedding band, and how Sadaam Hussein's uranium enrichment effort was discovered and how certain details of their process ultimately hindered its success. I was fascinated with his every word that day and felt like a spellbound child having a fabulous story read to them. I remember feeling especially fortunate *that day and* privileged *to have had the opportunity to participate in such an "intimate" tour and to share in the knowledge and experiences of such a wonderfully individualistic, witty, brilliant, and yet savvy man. And, being an innately curious person prone*

to asking lots of questions about things, one of the things I liked most about Dr. Googin was his infinite patience and enthusiasm for answering my questions. He didn't just tolerate the string of questions, he welcomed them and encouraged more. I'll miss him like a student misses the favorite teacher who leaves an indelible mark on his students.

Beverly Lomax

One of my fondest memories of Dr. Googin came about because of this love for chocolate. I had been in Development less than a year and brought in something homemade, i.e. fudge or brownies. I was bringing the item down the hall to put by the coffee pot so that some of the division could enjoy them. Dr. Googin was sitting in front of his computer in his chair on casters. I called to him, "Dr. Googin, I have chocolate." He rubbed his hands together, smiled, pushed his chair, and came rolling in the hallway for the chocolate.

I enjoyed Dr. Googin's warm, caring personality. It's difficult to believe he's gone. *Marie Mower*

I first met John in the fall of 1952 at a staff meeting of the Development Division. Since then, I had the honor of working closely with him on many programs at the plant. In the '60s and '70s, we made many trips together and made new friends in the government, the national labs, and in private industry. John's expertise and talents were quickly recognized by everyone who met him. His comments and suggestions on all types of programs were always informative and solved many complex problems for our plant as well as for other plants.

John was always a prime spokesman to upper management for the technical community. I remember a meeting in Pittsburgh where a technical person for a private company gave a presentation and presented final results that were not in agreement with those that a senior manager from Washington wanted to hear. The government official severely criticized the speaker and then asked John and I for our comments. John immediately defended the study and gave the government official a strong lecture on poor management style. Later the official apologized to John and to the speaker for his remarks. I did not hear any manager from the private company defend the speaker. Several of the technical people at the meeting wanted to buy lunch for John because of his comments. Also, the budget for the Y-12 program was later increased by the government official and he told me that the increase was partly due to comments made at this meeting.

I will always remember John as a close personal friend and his helpful comments and advice given to me will always be appreciated. *John Napier*

The two things that I remember and admire most about John Googin were that: 1) he achieved his reputation and recognition from hard work, long hours, and his own brilliance and 2) he judged others on their merit of their ideas, not their position in the company. *Robert Reiner*

Thanks, Dr. Googin

Doc would not allow himself to be under the tyranny of time. There was no established quitting time for himself - or those with whom he was working on crash projects. He would say that anyone getting over 5 hours of sleep was just being lazy. On several occasions I tried to remind him that I was a mortal and had to sleep.

In the mid '60's there was a project that went on and on, with many extra hours and days of work. One evening I told my wife I would be home at midnight. At 2:00 a.m. she called the lab and a person who answered the phone told her I was at another building getting a sample.

Said she, "Has that damn Googin still got him?"

"Yeah, guess I have. Yak, Yak, Yak!" replied Doc.

My wife said they talked 10-15 minutes, even at 2:00 a.m.

One of Doc's many admirable traits was that, "he was willing to bear the presence of fools gladly." His patience with us was almost a legend. He took the time to know each as a person and not just as a member of a group. I did have one dart to shoot back at him. Whenever he began good-naturedly to point out my deficiencies, I could remind him, after all, that he was the one who hired me.

I am grateful that I was allowed to work with and to know a man with such a brilliant mind coupled with an innate decency. *Lamar T. Royer*

When I started working for Dr. Googin, I was told that they wanted an office for him (thinking they could keep tabs on him) so they could find him. But, Dr. Googin just loved to go around the various labs in the area. He enjoyed being out in the field. This made it hard to find him. I think if a small lab was put in one corner of him office he would have just loved it.

After working with him for several weeks, I kept wondering when he would give me something to do (correspondence, report, etc.). A few days later I found he had gotten a manual typewriter and was typing away. (You can image how I felt. Especially when anyone came to see him, they would see me sitting there with nothing to do and see him typing.) When I asked him why he was doing his typing and not giving me the work to do, he said that his writing was hard to read. From then on I had plenty to do. I guess he was trying to get used to having a secretary.

There were times that I would have to locate him, for meetings, urgent calls, etc., so I would call different places that he would occasionally visit and asked if anyone had seen him. This would get me on his trail. When I found him, he would say, "How did you find me?" I would only reply "I had my radar working." I would never tell him who my contacts were even to this day.

I found that Dr. Googin (in spite of his high IQ and photographic mind) was down to earth. He would talk to you on your level. Many a times I would say, "Dr. Googin, come down to my level", and he would.

He and Dr. Strohecker were the top trouble shooters in the plant at that time. They would be called in at all hours of the day and night. This one time Dr. Googin went on vacation with his family and would not tell anyone where he would be, not even me. He made vacation uninterrupted.

He would tell the secretaries that he was surrounded by girls. He would say he had five girls at home and a family dog.

Dr. Googin always came to work dressed comfortably in a sport shirt. This particular time he was presented with a patent and pictures were to be made. So, being a "good secretary", I reminded him at the end of the day not to forget to wear his suit and tie. He politely said "if they wanted his picture they will take it the way he's dressed." Guess how that was? Yes, you guessed it. He was the only one in a sport shirt with several other people. And when VIPs would visit the plant, it was difficult to get him in a suit and tie.

Reports and letters which were being routed to several people would get bogged down in his office. One day I couldn't put anymore paper in his security file. I would say to him, "Dr. Googin it is time to read, there isn't any room in your file and no place to put it." He'd laugh and say, "I guess it is about time I did some reading." With his photographic mind, he had read everything in a few hours and the paper was forwarded to the next person. *Cleo Sideris*

I met John when I was given my tour of 9202 on my first day at Y-12 in August 1944. Then my first three day project was carried out in his lab under his supervision. I must not have done too badly as he asked for me to work for him in May 1945. In the meantime, I had made use of the books in his library in the lab to learn what the Manhattan Project was really all about. This next work period with him lasted until 1950. If I had not been working with John, my stay in Y-12 would have probably only lasted 15 months instead of over 40 years. I was later to work with John several more times over the next few years, and I was associated with him for the rest of my time in Y-12.

Working with John was really an experience that I never regretted. I got to work on interesting projects associated with the recovery and processing of uranium, the separation of uranium isotopes, the separation of hafnium from zirconium, the separation of lithium isotopes, lithium chemistry, the design and construction of the first safe geometry vessels for handling highly enriched uranium, and many other things. I was also introduced to other things such as chemical engineering. I was taught that you did not always need a key to get the necessary supplies in a locked room or even in a warehouse. If John was convinced that a project should be completed in a very short time, then it was usually done, and we were seldom more than a day or two late. He expected you to do high quality work. John was always trying to find a better way of doing things, and offered suggestions even after I was no longer working directly for him.

I owe much to him, and he will be greatly missed by me as well as everyone else. *Ted Sprague*

The World Within

There is another world
Different from the one we know at home.
Where your thoughts don't count to anyone
And you're basically all alone.

It can be so cold and lonely
As frightening as can be!
Without someone who cares,
And who will listen frequently.
I found that special someone
For whom I'd searched diligently.
He was always in demand by others,
But somehow had time for me.

He was wise and knowing
His reputation spread far and wide.
But to me was just Dr. Googin
My friend and constant guide.

I looked on him as a father
Which in the world of work is not done.
He encouraged me to be myself
And not pretend with anyone.
Stand up for right, don't compromise
He would persistently advise.
Be kind and gentle also,
Try to see through others eyes.

I will always take that advice
And try to do my part
To pass it on to others
To be hidden in their hearts.

It will be safe there
Protected, nurtured and warm.
And in some way Dr. Googin will be with us
To see us through every storm.

Sylvia Sterling

I Remember Dr. G

I always made it a point to stop to see Dr. Googin to spend time recalling some of the boyish antics of my eight-year-old son, Leslie, or to deliver a message from Leslie to Dr. Googin. I will never forget attending one of the Weapons Planning & Budget Group holiday dinners offsite at which Buck Lambdin was the featured speaker.

As Buck began his speech in his usual animated manner, Dr. Googin leaned over and asked a then three-year-old Leslie if anyone had ever taught him to "play the spoons." Of course no first-line caregiver is going to encourage the type of behavior that "spoon playing" instills in a child, so Leslie had no exposure.

Without hesitation (and just when Buck was gearing up), Dr. G. gave my baby two spoons and he took two spoons. Straight faced, Dr. G. began tapping out a rhythm on the tabletop. It took only a second for his young student to follow suit, and just a second more until Buck's speech was just about ruined. Buck talked louder, the tapping of the ***four*** *spoons got louder. I tried taking the spoons from the younger of the two boys, but the elder would not hear of it.*

After expending much energy to project his voice above the unsolicited musical accompaniment, Buck concluded his speech. Dr. Googin heaped praise upon his young student and encouraged him to play the spoons loudly and often.

For me, the evening became even more memorable when Dr. Googin picked up his willing partner in disruption, placed him on the table (black dress shoes still securely tied), to walk across to his wife. Mrs. Googin seemed undisturbed as she held up her arms to welcome the little tablewalker.

I gently chided the good doctor for teaching my child what I deemed inappropriate behavior. His reply was, "You wouldn't know this, but that's what grandfathers are for!"

God love him. He was a wonderful and caring human being who touched my life and gave me many lovely memories. I will truly miss him. *Sylvia Sterling*

There are many things which I think of when I think of Dr. Googin. Simple things such as popcorn and oatmeal, as well as, the way that he could question you and twist things until he was convinced you understood what you were talking about and had thought it out. I was always amazed at how he knew something about any subject that you could bring up. Offhand I can recall discussions on the Japanese mafia, mental retardation, natural pesticides found in trees and vegetables, cures for cancer and religions. He always enjoyed kidding me about dressing up for presentations saying that if you had to dress up to impress someone then what you were saying must not be too impressive. I think what I will remember the most though is that although he was such an intelligent and great man, he also cared for you as a person. He always loved talking to me about my boys because it reminded him of himself and his brother when he was little. He told me stories about how he would pester and beat up on his older brother. Then when the older brother would try to hit back, he would simply roll up his "roly poly" body (as he called it) and laugh, infuriating his older brother. One of his other favorite stories was the time that one of his elementary school teachers marked him absent because he hadn't said anything that day which was very unusual.

He always seemed to have a twinkle in his eye and loved to aggravate people whether it was his brother or someone trying to argue a point but it was always beneficial to the receiver. It was easy to take for granted the genius down the hall who always had an open door. *Lisa Thompson*

Dr. John Googin, A Tribute

When the ancient Greeks had a problem, they went to see an oracle, and there, amid plumes of smoke and vapor and virtual reality visions, they got an answer they hoped would be useful to them. Of course, the Greek oracles always spoke in riddles and with a double meaning, so that no matter what the outcome the prediction was likely to come true. For nigh on to 50 years, at the Y-12 Plant when we had a problem and had exhausted our resources without reaching a solution, someone would finally say the obvious, "Have you talked to Johnny Googin?" Some one or two of us would then proceed to the "Oracle of the Y-12 Plant" and present our problem. When it came to technical problems, John Googin was always ready to talk. He didn't need reference books, or notes, or assistants feeding him information,

he was always "ready." I don't know whether John was depressed by good news (by news that something was working just fine), as Kettering, at General Motors, claimed to be, but certainly, like Kettering, he doted on problems. His whole outlook was oriented to the solving of problems, and to helping others solve theirs. Usually quiet and unassuming in his demeanor, one could not help but be struck by his intellect. If there could be a "Man for All Seasons," here, certainly, was an "Intellect for All Purposes." One seldom failed to gain new insights into his problem, a new way of looking at it, a new interpretation of the data, a renewed feeling that there was a solution and of being better equipped to pursue it, after a session with Dr. Googin. In all that, he was ever gentle, never pointing out to us how dumb we were, by comparison, or how lacking in perception. John Googin was always a pleasure to work with, though sometimes we felt a bit sheepish after he had helped us to see the error of our ways.

The Greeks believed that happiness was not a feeling of the moment, but a lifetime pursuit. No man could be said to be happy until it was possible to say with finality, "His was a good life, well lived." I believe that is a fitting epitaph, that is how John would want to be remembered. He left his full share of "footprints in the sands of time." Not only at Y-12, Not only in Oak Ridge, but wherever on this earth men dedicate themselves to the pursuit of understanding, of understanding the physical world, of understanding man himself, there they are apt to find the footprints of John Googin to lend them guidance.

Farewell, John, we will miss you, it was an unmitigated pleasure knowing you. *Forrest Waldrop*

I met John Googin forty years ago when I came to Y-12 to work on the ADP project. Everyone looked about the same to me in those days because we all wore white shirts, white pants, yellow shoes, and hard hats. This was a pilot plant operation and that was the uniform of the day. It didn't take long for me to realize that John was an outstanding individual in many ways. As I learned to know John better over the years I knew he was a true genius and not exclusively to the scientific world by any means. His technical achievements have been recognized publicly but there are many untold recipients of his personal counseling as well as technical and political that will never be known. John had a way of inspiring you when you needed a spark to make you think. He had a way of chastising you when you needed it but you never came away angry. John will long be remembered as a caring person regardless of social position, job status, or political view. I consider it a privilege and an honor to have conversed and rubbed elbows with a man of the stature of my friend Googin. *Rayburn Waldrop*

I met John in 1944 shortly after he came to Y-12. I was then working in a lab I set up in 9206 helping solved problems encountered in the beta chemistry cycle: recycle, purification, salvage and conversion. John amazed us that year with how much he knew about uranium chemistry and how quickly he caught on and solved the problems that arose in operations on a daily basis. His superb knowledge of chemistry and his ability to solve problems encountered in technically complex plant operations were the great gifts and talents that distinguished both his early and his later career.

I moved to K-25 for the decades of the 50s and 60s, watching with awe but not too much surprise the great success John had in making key contributions to the Zr-Hf separation problem that helped us get our nation's nuclear submarine program going so fast, and the really tremendous work he did on Colex for the race with Russia to build better H-bombs. These were also the years of major contributions by John to the processing of all of Y-12's great specialty weapon materials: oralloy, alloys, lithium compounds and then reaching out to work with and to "tame" exotic and refractory metals across the whole Periodic Chart (which I believe John knew more about than any chemist I ever knew)!

When I came back to Y-12 as Technical Director at the end of the 60s, I had the good fortune to get to see at close hand how much John had done and was then doing to help, not just Y-12 but the weapons system, NASA, the Defense Department, the intelligence community, and then later on for the International Atomic Energy Agency as well. The 70s and 80s were, I think, golden years for John, having earned and now thoroughly enjoying his universally accepted role as our "senior guru" on any really tough technical problem: Y-12 process problems, K-25 centrifuge problems, design labs physics and materials problems, anywhere! He had a rare ability to step into the middle of a very tough technical problem, complicated enough that good people of different disciplines may have been struggling to try to get hold of it. He could pretty quickly bore to the center, invariably providing the leadership for people to understand the problem better, if not to solve it outright. His breadth as well as his depth of knowledge was most impressive. His sound base of knowledge was chemistry, but I'll wager there was never a technical problem in any field or discipline that he wasn't "at home" discussing!

The people in the Plant found John especially valuable through the years. He loved to get out in the plant and turn those knobs, but then could help craftsmen, operators, foremen, division heads, or the plant manager understand what the problem and the solution were.

He didn't spend large amounts of energy worrying about people's toes, budgets, procedures, or who gets the credit. He was almost exclusively interested in objective questions like "how was this supposed to work, why doesn't it, and how can we make it work." He solved the problem so much of the time that others of us were thrilled to tie up any loose ends. John was unique in his season; he was made for Y-12, Y-12 was made for him. What a high privilege it has been to work with and to know this warm, humane genius who did so much for his country, his plant, and for each of us who knew him.

William J. (Bill) Wilcox, Jr., retired

Awesome knowledge and capacity for learning!

There is a tremendous void in my resource bank. I always knew that whatever I had a question about, I could go to John to help with answers and challenges.

When I was giving a presentation and I knew John was going to be in the audience, I always prepared harder, because I knew he would ask tough questions. Making a presentation in front of John used to make me nervous because I felt picked on, until I saw him do the same things to Gordon Fee and Jeff Bostock...then I began to feel honored to be getting challenged.

Andrea K. Zava

MANHATTAN PROJECT AUTOBIOGRAPHY

The first four chapters of this story have been issued in previous copies of the FYI. For this special edition, we have compiled the complete story. (Unfortunately, we only acquired five chapters.)

GOOGIN AND THE MYTHICAL EARLY DAYS OF Y-12

Chapter 1: Getting to Y-12 The author, born in 1922 and raised in Lewiston, Maine, has to admit to some dimness of, and some refinement of, memory over the years since he arrived in Oak Ridge on a warm day in May of 1944. There just might be an unintentional, very small error or minor exaggeration in this text about the early days somewhere.

In January of 1944 he had asked the head of the Chemistry Department at Bates College in Lewiston, where he graduated in March because of the World War II accelerated time schedule, if there were any interesting projects that fit his background, which looked rather good on paper, on which he might find employment. Dr. Walter A. Lawrence told him there were several interesting situations that he knew of, one at Columbia University in New York City, one in the state of Washington, and one in Tennessee. Being somewhat tired of the winter weather in Maine (there had already been 200 inches of snow so far that year), he asked for the way to get in touch with the project in Tennessee.

His application went to Eastman Kodak in Rocheste, New York, which seemed to be involved in some secret project in Tennessee. He was accepted depending on his status of deferment from military service. The Selective Service Induction center found him to be 4F near the end of April, and he packed up to leave home for the sunny south. The ice had just gone out of the lakes in Maine, and it had snowed again during the recent trip to the Induction Center.

He got to Knoxville by train on May 9 with no more new knowledge of the particular project except to expect that it would be a temporary thing and not one upon which he was to spend his entire professional life. He arrived with a great sense of adventure because to him the South had been New York City, not an East plant known as Y-12 in the place called Oak Ridge.

That ride down the Oak Ridge Turnpike was very educational. Just inside the gate there was a little stone house that looked rather substantial. As progress was made down the turnpike there appeared a lot of housing and housing construction on the right. It was plain but looked as though it was liveable. In the middle of town the Turnpike turned from macadam to dirt and there was a large commercial area on the left. It was surrounded with little huts, and on the right there was a sea of small house trailers with community wash houses. As the bus progressed some more to the west, there were large

two story dormitory buildings on both sides of the road and some tennis courts on the right. The bus turned in beyond the tennis courts and stopped at the roadside bus stop in front of a large building labeled Cafeteria. The bus driver said to take that board walk going further west if the goal was dormitory WV-34. There was no door-to-door delivery.

The boardwalk went along an oval path with twin wing dormitories all around the outside of the oval. The land in the oval was not "well" landscaped. A sea of half dried mud was the impression. About half way down the oval by the boardwalk, there was the building labeled WV-34. Right in front of the building in the oval land, there was a vision of a D-8 Caterpillar tractor with a bulldozer blade with the blade and about half the tractor down into the mud. The seat and the rear of the treads could be clearly seen, so the driver probably survived. It was gone the next afternoon; probably by recovery, not sinking out of sight.

The dormitory entry was in the middle of the long side toward the oval. On entering there was to the right a front desk and a clerk. The clerk did recognize the piece of paper from the Daylight Building experience as proper, and the author was assigned a nice little cubicle to the left, on the first floor, just down the hall with a window looking at the other wing. There was a narrow bed with bedding, a small desk, a desk chair, and a low slung sitting chair and blinds in the window. One could reach from wall to wall the short way. This room, 108, was very convenient to the wash and laundry room that was along the hall connecting the two wings of the dormitory.

His first work experiences in Oak Ridge consisted of some training in the art of being a future group leader in some unknown group, working on some unknown process for a week at a buff-colored tile building in back of a large rambling wooden building in the middle of town. This was found to be the area headquarters for the Manhattan Engineering District of the U.S. Army and also "affectionately" known as the Castle on the Hill.

The week in the "Bull Pen" at the buff-colored building was really to pass the time while security clearances were established. To pass the time, they examined you for your basic skills and discussed some aspects of the organizational structure, security requirements, and how to get along with those above and below in the organization. This young BS chemist was not greatly interested in "management" and some time was spent finding out what others were being taught. Some at the "Pen" were given elementary chemical laboratory technique experience, but that was again not of great interest to the new BS degree chemists in the classes. It developed that some were being introduced into the operations of some strange instrument panels with lots of meters and switches on them, and this was much more interesting and probably involved physics, but the information was not too instructive.

Besides finding out that the bus routes went all over on the mostly dirt roads about town and that there was a "scheduled" thunderstorm every day at 4:30 PM, not too much was learned about the place during the first week except chemistry and physics might be involved. Nothing more was learned about the details of the processes that one would have to deal with doing the basic job, hopefully, in the very near future.

At the end of the first week there were instructions for this candidate to find the way to the place called Y-12, a building numbered 9202, and report to a man named Robert J. Schmidt. It appeared that the real work was about to begin, and sooner than was expected because others had been in the "Pen" for weeks.

The work buses left for Y-12 from the nearby WV-34 cafeteria bus stop every few minutes at shift change time. A bus was caught for the Y-12 North Portal and the first of thousands of trips to the plant was started. The route went through an unexpected area, not found on the city after-work bus trips, where there were many poorly constructed hutments and lots of black people.

This came as a surprise to a young northerner whose experience with black people in his youth had been dominated by doing business with one

George A. Ross who had a basement "Celebrated Ice Cream" store in the house where he lived on the second floor. This store was half way between home and elementary school and an easy summer time walk from home. Mrs. Ross ran one of the better tea-rooms in town on the ground floor.

During college at Bates, there had been black students who were very competitive, and also black students in the less-advanced classes who were helped by a laboratory assistant. In fact the trip to the Induction Center had been made with one J. Wesley Parker from Washington D.C. who was black, and one Hank Fukui from California who was Japanese, but somehow managed to avoid the internment camps.

The final leg of the trip, WV-34 to Y-12, was very short even if the thoughts along the way were very many before arriving at the massive bus terminal at the Y-12's North Portal. Here buses from as much as fifty miles away delivered workers every shift. They arrived and left every few seconds from many places at shift change and once an hour from the Oak Ridge Bus Terminal all day long.

The correct guard room was found, the papers were in order, badges were made, one of the row of guards in their little stands along the portal allowed entry and pointed out the short walk down the hill to Building 9202. It was May the 17th in 1944 and the badge number was 17,187. A lot of people had made the transition into the secure system in the year and a few months since the project had started at Y-12, if the badge number was any indication.

The cultural shocks were to continue for the author, and there were to be some for B. J. Schmidt.

Chapter 2: The First Day of Work. To remind the reader, the first day in Y-12 started with that walk down the hill from the North Portal to Building 9202 and then to the first visit in the office of one R. J. Schmidt, the head of the department known as Bulk Treatment.

His office was on the first floor of 9202 in a room at Column D-9, back next to the south pad.

There was a large scrubbing system visible through the windows of the office that was mounted on the side of the building, storage tanks and a small electric substation.

This office was just across the hall from the office of Dr. Bell, who was the head of the Chemical Operations. There was an office for the building engineer next door. There were secretaries with the up to date (1944), manual typewriters, mimeograph machines, and clerks with the latest in mechanical calculators.

The office with a southern exposure was hot even in May. The windows were open, and a standard piece of equipment seemed to be a fly swatter. Strangely enough, another standard piece of equipment seemed to be a gas mask. The recruit was beginning to have some doubt about the nature of the work.

This new recruit was asked to sit down across the desk from Mr. Schmidt. He was introduced to a tall blond person named Edwin Samuel Vitalla (who claimed to be of Finnish extraction) to whom the recruit was to report. The first order of business was to be a quick tour of the small part of the facility to be worked in and then a return to the office for further discussions. A lab coat was put on and the tour was led by Ed. The tour was just off the one large room that held the Bulk Treatment Department equipment. It was the room that is now the foundry area in 9202. This old version of the room was equipped with a series of 250 gallon agitated, glass-lined, jacketed reaction vessels, high speed centrifuges, settling tanks, rotary filters, polishing filters, continuous centrifuges, driers and kilns and the usual associated valves, pumps, pipes and feeders. The open process equipment showed yellow solids and the room had the odor of ammonia.

The rule of the observation game was that all the tanks and lines were labeled in number codes and no one could, or would, say what was being processed or the real name of anything of significance. There was a laboratory of sorts on the balcony off the highest operating level that was going to be the work area. The equipment was generally smaller than that in the bleachery and dye house where the recruit had worked for a summer, and much of it was familiar from the texts in school. After the short walk up and down the stairs and through the room, the little tour returned to Mr. Schmidt's office.

Back across the desk from Mr. Schmidt, the new recruit was asked what he thought he had seen. He considered the unknowns and knowns for a few moments to weigh the possibilities of such a large facility (a facility smaller than the ship yard in which the recruit had worked as a youth), a facility of which he had only a brief glimpse walking down the hill from the gates and the little he had seen in one room of 9202 and came up with the following answer.

"You are processing a heavy metal. It is probably uranium. You are separating the isotopes to make an atomic bomb."

Mr. Schmidt, and no one on the project for that matter, knew then that the recruit had been working, as part of his educational program, on the atomic energy possibility for the previous four years on the assumption that nuclear energy would be part of the wave of the future.

There was a moment of silence and then a slow and guarded comment that was the quickest penetration of the security system on their records. It was said that it took some of the professional technical new hires as much as weeks to come to the correct conclusions.

All this was followed with a lecture on the nature of the security system with almost everyone in isolated boxes and with the meaning of the codes, like 704 means hydrogen peroxide and the element being processed is T for Tuballoy and it makes a compound known as 724 with hydrogen peroxide because Tuballoy is really 720.724[UO(4)] can be converted to 723 [UO(3)] by calcination, but 728 is liquid nitrogen.

The emphasis was on not revealing what was being worked on to anyone who did not need to know, even when that person could be expected to deduce it eventually themselves. By definition only "some" of the research people, like the process chemists, needed to know that it was uranium that was being worked with and most of them did not need to know what was going on in the rest of the plant.

It was immediately obvious that nearly all of the operating personnel in the chemical operation in Bulk Treatment were female. They were mostly young and were there in all the expected sizes up to considerably taller, and apparently stronger, than the new recruit. There had been some women at the shoe factory where the recruit had worked and a few at the ship yard where the recruit had worked a summer installing degaussing belts in 10,000 ton freighters, but it was never like Y-12 with nearly everyone female and dressed in similar white, poorly fitting, cotton, company clothes.

The organization of the Y-12 plant was in small functional areas with restricted movement between areas. The badge worn by everyone, even as now, had a series of letters on it, up and down the sides, which gave permission to enter a limited number of related areas. Each area was fenced in and there were guard portals for entry. Special permission had to be gained to visit other areas.

Everyone who worked with the T (uranium) was required to change clothes; visitors could just wear white lab coats. This outfit was really all the clothes including the underwear, the shoes and the socks. Showers were to be taken. There was laundry service and clothes replacement when they developed too many holes. It would quickly become evident that the 35% 704 (hydrogen peroxide) and the 70% 703 (nitric acid) could do great damage to the cotton clothes that were used.

After the security and general operations lecture, the recruit got a description of the processes performed in Bulk Treatment and some associated areas. Those gas masks in the office had a real purpose.

Part of the process was the manufacture of TCl(5)(745) by reaction of 723 with 753 by heating in glass lined and agitated pressure vessels to make phosgene as a by-product. Those towers outside the office window were the scrubbers that reacted the phosgene with caustic to make it harmless. However, there were times when there were leaks and the masks were sorely needed. This chlorination all took place in the tall tower section of 9202. There was an emergency ammonia system to react the phosgene in case of a leak and fogs were produced.

There were rooms of sublimation units where the TCl(5) was decomposed to TCl(4) and this was sublimed to purify the material. The purified tetrachloride was bottled under dry conditions to be taken to the next undescribed part of the process. In Oak Ridge summer air, TCl(4) in a thin layer would turn to liquid in seconds.

The chemistry of the Bulk Treatment area was to take a solution of tuballoy called "Gunk" that came from the cleaning of those mysterious machines in other buildings and make pure 723 (uranium trioxide) out of it. The gunk was a mixed chloride, nitrate solution containing T+4 and T+6 along with copper, iron, chrome, and nickel in solution among other things and as solids.

The first step in its purification was to make sure all the T present was oxidized to the plus six condition with 704. The objective was to eventually keep the uranium in solution as the complex of T+6 with carbonates. The next step was to reduce the acidity with 707 (concentrated ammonium hydroxide solution) to near the iron three precipitation point and the last to add powdered ammonium carbonate to make the solution alkaline with excess carbonate present.

This carbonate treatment precipitated the iron, chrome three and a few other elements, and the sludge were collected in the high speed Sharples centrifuges. It left the elements that complex with ammonia like copper and nickel in solution with the T. This clarified solution was then made acid with 703 (nitric acid) to remove the carbonate. It was immediately made alkaline again with 707 to make 727 (ammonium diuranate) in suspension and the mix was transferred to settling tanks to make a thick slurry. The ammonium nitrate and chloride solution with the copper and nickel in solution as their ammonium complexes was decanted down the drain through a polishing filter.

The slurry was pumped to the rotary vacuum filter with the filtrate and the wash solutions down the drain with the copper and nickel.

The solid was reslurried with water and transferred to the next reactor. 703(nitric acid) was added to make an acid T solution and 704(hydrogen peroxide) was added to make a new precipitate of 724 (uranium peroxide). This was sent to a Bird horizontal centrifuge to continuously collect the precipitate and feed it to a drier and then to a calciner to make the desired pure 723 (uranium trioxide) for transfer for reaction with 753 to make tuballoy tetrachloride. Again, the decanted liquor from the centrifuge went down the drain through a polishing filter as p(H) 1-2 ammonium nitrate solution.

The major control instrument for all of this was the p(H) meter reading a grab sample. There were thermocouple reading controllers on the kilns. The levels in vessels and tanks could be taken with a dip stick.

After all this education on security and process, the first day came to an end with a walking trip to the warehouse, at the same location as the present 9720-6, with Ed to get the first batch of needed clothes. The walk was along the railroad siding that brought tank cars of chemicals to 9202.

There had been considerable discussion along the way about the immediate objectives of the laboratory assigned to the Bulk Treatment operation. The plant needed to produce more and more as the new production buildings came on line. There was an expansion of Bulk Treatment underway, but it would be six months or more before we could finish it and the need was to make the present plant much more productive in the mean time.

All of these discussions of the day had led to a conviction in the new recruit.

On the way back from the warehouse with the clothes, the conversation turned to the near future and the new recruit told his new supervision that all of the evidence on hand to that time indicated to the new recruit that the immediate goals could be met. It was suggested that the recruit would be supervising his present supervisor within the next three months.

Chapter 3: ***A Y-12 Junior Chemist's 1944 Production Year.*** In the early weeks of 1944, Alpha-1 (9201-1) in Y-12, was being put on line as the first uranium isotope separation production process in the world. It did not really go too well. What had been a field by a stream in a poor valley a year and half before was now the center of a major industrial empire. The first of the buildings using a process, that many were saying would never work, was being placed in operation with great difficulty. The crew finally had to admit that the plant in its "as built" shape would not work because of electrical problems. It soon became apparent that much of the equipment connected to the cooling system for the units and the magnets would have to be disconnected, and the whole system systematically cleaned. The contamination in the systems would not allow the needed high voltages and stable currents. This was completed in another month and the building was restarted to continue in operation successfully until it was shut down in September 1945, after Hiroshima.

When the author arrived in May 1944, the trauma of the start-up of the first building was over, and the subsequent buildings were rapidly coming on line. For the author, as a process development chemist in the Bulk Treatment Department in 9202, a problem that would continue was the processing of the flood of wash solutions from the Alpha buildings. We had to use the equipment at hand to recover the uranium as the pure oxide, and supply it to the Liquid Phase Department for the formation of the uranium pentachloride by reaction under pressure with carbon tetrachloride at elevated temperatures. The pentachloride went to Sublimation where it was decomposed and vaporized as the pure tetrachloride feed for the Calutrons.

There was a Bulk Treatment (BT) Addition to Building 9202, using the existing process, that was being constructed for completion in 1945, but the foundation was just being laid. Those working in BT entered by a security gate and through a change house where they put on company whites every day in the building next to 9203, and had a covered walkway to 9202. The construction of the 9202 addition allowed unchecked access to 9202 for a while.

The Calutrons in the Alpha buildings were using much more feed than the original design work had indicated, and 9202 just would not have the capacity needed. It was needing two or more times the expected feed to get the desired current flow. The process in use had been developed at the research laboratories of the Eastman Kodak Company in Rochester, New York, early in the preceding year, when there was only one experiment unit in Berkley at E.O. Lawrence's laboratory.

The process in 9202 was to receive a dilute solution of uranium, a liquid called Gunk, prepared by washing down the source parts and vacuum tank liner and baffle parts of the Calutrons with dilute nitric acid. Since the feed to the Calutrons was uranium tetrachloride, and only about 15% of the charge was consumed in the units, there was considerable chloride left in the solution so that the problem was one of handling dilute aqua regia which can corrode many things. Because of this the plant was equipped with glass-lined reaction vessels and ceramic and glass pipes for the first stage reactions.

The first reaction set in BT was to oxidize the acid solution with a little hydrogen peroxide, and then to add ammonium hydroxide solution to bring the pH to near neutral, and finally to add powdered ammonium carbonate to complex the hexavalent uranium, copper and nickel and leave iron, chromium, and aluminum as precipitates. This was done in a 250 gallon, jacketed, agitated, glass lined vessel as were the other reactions.

The hydrogen peroxide, nitric acid and ammonium hydroxide were piped into the reactors in the plant from large storage tanks. The ammonium carbonate was delivered as large blocks in large fiber drums. It had to be broken and fed to a grinder situated near the first stage reactor, collected, weighed and fed by bucket to the reactor. The dilute slurry of ammonium carbonate solution insolubles was passed through high speed (20,000 rpm.) four inch diameter, stainless steel, centrifugate was collected in large tanks. There were a half dozen centrifuges in a row and the noise was nearly deafening.

In a second reactor this solution was made acid with nitric acid, and warmed to be sure to remove the carbon dioxide. It was then made basic again with concentrated ammonium hydroxide solution, to precipitate ammonium diuranate and leave the nickel and copper in solution. The dilute slurry was pumped to settling tanks to form a concentrated slurry to be fed to a rotating drum filter with washing option, and then to a repulper to be fed to yet another reactor. The supernatant from the settling tanks was passed through polishing filters to remove the last bit of precipitated uranium compounds. The ammonium nitrate solution with the nickel and copper was discharged to the creek. The ammonium diuranate precipitation is not as good a purification separation

as was desired. This precipitate acts as an ion exchange medium for both anions and cations and carried more of the ich would feed the chlorination step. The concentrated nitric acid and ammonium hydroxide used came in by the tank-car load.

This need for further purification was handled by the use of the peroxide precipitation from nitric acid solution with piped-in hydrogen peroxide and ammonium hydroxide. The ammonium precipitation step served to raise the possible concentration of uranium to high values and this served to compensate for some of the problems with a quantitative precipitation of the peroxide. As originally done, the uranium peroxide was impossible to filter, and the recovery was done with a horizontal centrifuge with a washing beach, the wet cake being discharged into a dryer-calciner system to make the uranium trioxide powder for chlorination. The acid centrifugate was polished in wine-style filters and discharged to the creek with the copper and nickel that remained, and lots more ammonium nitrate. Hydrogen peroxide at 30% was received by the tank-car load like the other chemicals. There were some corrosion problems where the aluminum pipe of the peroxide storage tanks joined the stainless steel of the piping, that had to be solved with electrically insulating joints.

All of these steps were done in what is now the foundry in Building 9202, and the author worked in an impromptu laboratory on a storage balcony that overlooked the operating floor from the top of the highest reactor floor. All the heat of the summer and the process rose up to there. There was the row of half a dozen of the high-speed centrifuges just below the lab floor that roared day and night. The dryer-calciner system kept hot air rising toward the roof. Yellow uranium oxide dust settled over everything, because the very fine oxide powder made from the peroxide was hard to hold in the calciner. This author's desk received 50 mg of uranium oxide per square decimeter per day. The uranium throughput was hundreds of pounds per day and the need was soon to be for thousands.

Parts of the plant made of 304 stainless steel were corroding away at the welds. One of the first jobs was to set up corrosion tests of samples of welded stainless steels, to find out which of the commercially available ones would be best for replacement of the one originally used, and for the new facilities. It soon became apparent that the carbide precipitates in the heat affected zone of the welds was a large part of the problem, and that the low carbon version of 316 was the obvious choice above 321 and 347 for the future stainless steel applications.

All of the chemical operators in the bulk treatment department were women. They were all local people from East Tennessee and adjacent states. The ladies selected to handle the heavy centrifuge bowls on a routine basis were big and strong. All of the forepeople were men. Some of the better-educated women were tried as forepeople. In every case this created conflict in the ranks of the other women. It was found that the ladies would work together under a man and even try to make him look good, if he was not too able—but nice. Under the press of wartime, little time could be taken to improve the situation. A number of better educated women were made into laboratory technicians and some were assigned to work with this author from time to time.

To say the least, access to information was restricted at first. The clearance level of this junior chemist working for 95 cents an hour was not too high. A weekly progress report was required; this was combined with progress reports from other parts of the chemical operation. This author was allowed to write and hand in his report, but could not get the combined report back to read. You could not easily get reports from other parts of the system that were working on similar problems and it was hard to even find out the existence of other efforts. A quick trip was taken to the University of Tennessee library for a look at Mellor's Handbook of Inorganic Chemistry. It was found that this volume would fall open to the chapter on uranium with little help and the page edges there were dirty. You really did not dare take notes or read too long. Quick memory was the order of the day. It became important to have many contacts that allowed bypassing of the security arrangements to gain needed knowledge. (Ed. Note — thus providing an object lesson reinforcing a long-term interest of this author.)

There were plenty of the standard reagents of the time in the laboratory, and certainly a large supply or uranium, so that the education could get beyond much of Mellor in a very short period of time. The first assault was on the peroxide precipitation, and understanding it so that it could be made more quantitative and could be settled and filtered more easily. It soon became obvious that the control of the pH was most important (there were pH meters available) and that most of the precipitation should be done under very constant conditions with the solutions at hand. Simultaneous additions of peroxide and ammonium hydroxide, with good agitation in a baffled vessel, gave a precipitate with the process solutions at hand that would settle better and filter faster.

The final peroxide precipitation was modified with a settling tank and a continuous filter to increase that throughput of the process. The filter washed and dewatered much better than the continuous centrifuge, and the throughput of the little plant increased substantially. Similar emphasis on precipitation control increased the throughput of the diuranate precipitation. It was only three months into the job, production was up to current need, the author got promoted to a dollar twenty an hour, got more clearance, with training in management, employee relations, statistics, and the merit pay plan. This was actually a cut in pay since the new scale had no overtime, and at $0.95 an hour with lots of overtime it had been good money on the starting rate. The Kodak 13-period year became more natural than the outsider's twelve months.

By this time it was obvious that it was not too safe to eat in the general run of cafeterias in Oak Ridge proper. An experiment was started in which three meals a day were taken in the Y-12 cafeteria. The author's general health showed an immediate improvement. The work schedule settled into a shift and a fraction a day for most of seven days a week. On the old rate weekends had been taken off, and the area had been scouted on the free buses that went in all directions. Some familiarity was gained with the X-10 and K-25 sites from the outside, as well as many parts of Oak Ridge. The valley was filled from ridge to ridge with dust from the unpaved roads during the hot dry days of summer.

The work on the peroxide precipitation continued. The attempts to get lower and lower losses to the filtrates went in the direction of controlled excesses of peroxide and cooling the solution to near-freezing before settling and filtration. This precipitation was now done with the Gunk solution as received, but it was dilute, hard to settle to the needed degree, and came with an iron-copper combination that catalyzed the decomposition of hydrogen peroxide. After many experiments, a flocculating agent was found that would work in the Gunk, so that the whole recovery could be done in a single step and all of the equipment could be devoted to the step. The cold finish allowed the needed peroxide concentration and low gassing rate from decomposition. The capacity of the system went way up, and the expansion of the efforts in the Alpha buildings could be supported with the equipment at hand.

Those planning new recovery systems for the Beta buildings asked for some experiments with their typical solutions. The techniques for the cold Alpha cycle were found to work as far as the proposed Beta operations were concerned, with an adequate degree of precipitation of the enriched uranium involved. They decided not to flocculate and filter, but to go directly to safe geometry centrifuges like those used to process the iron precipitates of the old first step of the Alpha chemistry, to forego the washing options.

By this time Ted Sprague had joined the BT laboratory, and many more of the details of the plant operation could be taken under consideration, like helping with the conversion of the Liquid Phase chlorination step to the Vapor Phase style of operation, with a process developed by Harshaw Chemical. This allowed the elimination of the decomposition and sublimation step that had been used to convert the pentachloride from Liquid Phase to the tetrachloride, as feed for the Calutrons. Even the general problem of the wastes from the building was examined for minimization. The building sump tank showed layers of uranium-bearing solids of various valence states and colors, and included mercury.

It was not expected during the summer of 1944 that the K-25 plant could get to above 3.5% assay efficiently, so plans for a new 9202 and 9207 were started to be able to handle this assay of materials safely. The original Kodak chemistry was adopted. Batches were to be kept separate going through the plant from Gunk to sublimed tetrachloride, and double batching was to be controlled with an elaborate system of interlocks so that only the correct valves and operations could be used. Many of the proposed steps, from the solution received to the calcination of the oxide, had to be checked out for the parameters of the new mode of operation.

One of the pleasures was the designing of a new BT laboratory for 9207, with a good set of equipment and a pilot plant area with all of the needed services on the walls, and equipment for the needed unit operations on wheels, so that the pilot plant experiments could be assembled in days for the expected experimental needs. The future of the project was not sure, but it seemed that it could be interesting. A transition from a lab built as an afterthought to one planned for the job was sure to be exciting.

The 1944 year closed with considerable hope. The Alpha cycle was well established, and two new-style Alpha buildings were being added. 9202 was keeping

up with the demand with the latest modifications. Preparations were being made to receive enriched UF(6) from S-50 and K-25. The Beta cycle was up and running with some top-grade product in the pipe line. The Beta cold peroxide was performing as desired in the Beta buildings. Building 9206 was doing the balance of the Beta cycle. The first samples from Beta had been watched as they went through the final laboratory-scale purifications in 9203 earlier in the year. Building 9203 was the first processing building for the Beta intermediate and product cycles, where solvent extraction with diethyl ether was used to purify and recover the uranium instead of using precipitations as in 9202.

It was known that Los Alamos was getting the product materials and was working on the item, but to what effect was not known to those at the author's level.

Chapter 4: Some Junior Chemist Experiences, Summer of '44 to Summer of '45, Part I

Some Generalities. There were many unusual events in the hectic life of the Junior Chemist in the little over a year from hiring into Y-12 in May of 1944, to August of 1945 and Hiroshima. There were many interesting situations and many interesting characters to work with. Most of the activities of the period were associated with the Y-12 Alpha chemical recycle work, to make (in one way or another) pure uranium tetrachloride for feed to the Calutrons. The Bulk Treatment (BT) Laboratory became somewhat of a crossroads for uranium chemistry work in Y-12. There were only a few days off and little contact with the other sites in Oak Ridge, beyond bus trips there and back to satisfy curiosity. K-25 did not look too far along in early 1944.

A few observations of the environment were made during bus rides about town (the bus rides were free). In the summer the valley of the City of Oak Ridge was filled from ridge to ridge with dust from the unpaved roads. In the winter it was filled the same way with the black smoke from the soft coal used to heat the homes in inefficient furnaces. Everything got that gray look in the winter. There were no problems with heat in the dormitories, but there were with bed bugs. Got some DDT from a military friend.

One could hear the Y-12 horn all over town. One could at times hear a roar in the background, especially along Outer Drive. That was Y-12 running, but it was the sound from the ventilation fans in the rows of Alpha buildings that made the noise, not any element of the basic Calutron process which all ran rather quietly.

There was an interesting mix of people on military status who worked on the project. These people in the military were selected from all branches based on their skills and came in two kinds: Those who worked just like the civilian employees; and those who were the "military" group that were the counterparts of the DOE of today, and were ultimately the managers of the operations. Some, who were seen in company clothes most every day, would suddenly appear as uniformed military officers for a time. When General Groves was expected, there were the usual attempts to make things look better than they really were.

Some time was taken to write to buddies in the service and to home. You could not say much, beyond that you were working on something big and it might keep them out of Japan. One person being staged for Japan wrote back that he already knew of radar and proximity fuses, but what else could you say? After Hiroshima there were notes of thanks.

One could take the bus to Knoxville, which was under its own pall of black smoke in the winter, and visit the library at the University of Tennessee where the texts that mentioned uranium were found to be well used. They would fall open at the interesting pages, and there was that discolored streak along the closed pages.

There really was a lot of social life in Oak Ridge; bt for the author, the more-than-one-shift-a-day work pace interfered with much of it in the time period of '44 & '45. Dances at the tennis courts were a feature in the summer. There were tales about what might have gone on in the houses where six young men lived together, and other houses where six young women did the same.

Some Specifics on the Job. Nearly all of the process operations, either chemical, physical or clerical, were performed by the ladies of East Tennessee. There were mostly men in the technical, engineering and maintenance crews.

The laboratory of the author, with its vacuum furnace, became a resource to the ladies in the 9202 area. This was where mercury cathodes were used to put uranium in the burgundy three-valent state, then air was used to get the green four-valent state which was precipitated with oxalic acid to form uranium (+4) oxalate to obtain concentration and purification of the Beta cycle uranium. This was part of the enriched uranium (the Beta machine recycle) process that was located in 9202 in the early days of 1944.

The ladies who operated the oxalate process were always getting their gold jewelry exposed to traces of mercury, and the vacuum furnace in the BT laboratory was routinely used to remove the contamination before the rings and such were destroyed. Some still came out frosted, unfortunately. It was known that some of this mercury got into the drains from 9202.

The career was moving along. The weekly pay with much overtime was good; but this became the monthly pay without overtime when a position promotion was given, yielding a sizable cut in the net pay. T. P. (Ted) Sprague joined the BT technical group and later Tom Strickland was added. With a technician or two, as required, there was soon a considerable power in the group. Sam Vitilla, the original group leader, left for other positions. The range of interests of the group kept expanding from basic chemistry and chemical engineering. Corrosion,

especially in the heat-affected zone of welded stainless steels in the chloride- and nitrate-containing process solutions became a hot topic for a while. Extra-low-carbon 316 was the answer.

One of the jobs was to keep an eye on the sump tank on the process sewer line from 9202 to the East Branch of Poplar Creek. There was mercury to be found there along with some uranium , chromium and iron hydroxides. Some of all this was certainly reaching the creek. Uranium waste solutions were very low in U and U-bearing solutions were supposed to be collected for salvage or discard in pits. There were containment dikes on the floors, but some solution was being missed, going down the drain to the sump and then to the East Branch of Poplar Creek.

There was a hood on the first floor of 9202, under the tower (high head area), where the residues from the distillation process were washed out of the trays from the uranium tetrachloride sublimation stills. The hood, the floor and the operator were green from the residual uranium (+4) chloride, and some more uranium certainly went down the drain if those clothes went to the laundry.

The uranium tetrachloride is very hygroscopic. It was desired to avoid water contamination, so that the Calutrons would be more efficient. This resulted in the first "dry room" in Y-12 where the uranous chloride was loaded into the charge bottles for the Alpha tracks. Some of the present controls for the protection of products, people and the environment have a history from their beginning in Y-12.

While working the second shift of the day, one dy in about June of '44, there was a incident of this "to the sewer" kind. The time was during the bicarbonate-complex-process period and this worker was in the laboratory on the balcony overlooking the Bulk Treatment production line, the present 9202 foundry. Suddenly there was a column of yellow liquid coming out of the small lid of the 250-gal reactor, where the nitric acid was added to remove the carbonate from the complex and make uranyl nitrate solution. The column of liquid went all the way to the ceiling of the room, and the resulting yellow flood covered much of the floor, overflowed some of the curbs, and some went down the area drains.

It appeared that the operator had added much of the nitric acid without the agitator in operation and only then had turned the agitator on. The large amount of acid mixed rapidly with the uranyl carbonate complex solution, to give a rush of carbon dioxide that emptied much of the contents of the 250-gallon reactor into the room and left that yellow uranium spot on the ceiling. This one incident probably put tens of kg. of uranium down the drains.

The high-pressure liquid-phase chlorination of the uranium trioxide with carbon tetrachloride produced a solution that contained a large concentration of phosgene in the excess carbon tetrachloride reactant. Sometimes samples needed analysis and they were transported to the BT laboratory in glass-stopper-style erlenmeyer flasks. These samples came from cooled vessels; by the time they got to the laboratory they would warm up, the phosgene pressure would lift the stoppers, and they would give off a puff of phosgene and make a little burping noise, giving the operator a whiff of the gas.

It was interesting to try to do the measurements without a good hood and without the trouble of using the handy gas mask. It should be noted that there was no air cooling anywhere in the building, but some ventilation through the window in the summer time. It was recommended that the simple titration be done in the process area that generated the phosgene and had special ventilation, rather than in the

Bulk Treatment laboratory that had little ventilation and hood space.

Even though the phosgene was made by the ton, few were hurt. Unfortunately, one maintenance man was killed. It was one of these cases where work was to be done on a pipe line that was "empty" as defined by the safety work permit, but that was really full of the carbon tetrachloride and phosgene solution when it was opened.

There was some air cooling in 1944 in 9203. Y-12 was doing enriched-uranium purification with the diethyl-ether solvent extraction of the nitrate method, and since this ether boils at 35 C (95 F) and the room temperature in the summer could get higher than that, some cooling had to be supplied, making that a good place to work or visit in summer if you liked the smell of ethyl ether. Some of the first of the highly enriched uranium for Los Alamos was seen there in pure nitrate solution form in the early summer of 1944.

All of the electrical fixtures in the ether area had to be of the explosion- proof kind, including the lights, so the area had a worrisome appearance. There never was a serious fire, even though some ether dripped from a pipe leak outside the protected area onto a hot muffle furnace as it went from one area to another. There were cases of small ether fires where the flame from a Bunsen burner went from one lab bench to another, following ether vapor across a floor.

There was that weekly progress report to get out, and there were the design data deadlines for the 9207 complex to reach. Sometimes this pressure caused some really extended work times. The longest remembered was a work period of forty-eight hours in a row, to get data needed for decisions on the details of the new peroxide precipitation and calcination for the simplification of the flow diagram in the Bulk Treatment process. One must admit that the last few hours (after 36 hours) were not too productive.

There were extensive experiments on better ways to do the chlorination of uranium trioxide to uranium tetrachloride, by the Process Improvement group and outside contractors. Some of the experiments were done in the production area. The rotating-nickel-drum batch reactor for vapor phase chlorination (developed by the Harshaw Chemical Co.) was adopted as the standard by the Production Department to replace the liquid phase process, but this was a batch process still. It was better in the sense that it produced the tetrachloride instead of the pentachloride that was the primary product of the high-pressure liquid carbon tetrachloride process, and the decomposition and sublimation steps were avoided if the oxide feed was pure enough. A continuous vapor-phase chlorination of a dancing bed moved by vibrators was installed on an experimental basis in 9202. It was interesting, noisy, but difficult to operate.

This vibrating bed reactor resulted in complications with Project Security. The writer and a colleague decided to leave a little early one day, about 10 pm. This would avoid the rush of the eleven o'clock shift. After getting on the bus, with only the driver present, there was some talk in code of how to get the 723 to flow better, about how to insure good solid contact with the 754 vapor, and the quality of the 757 produced. It seemed that the bus driver was an FBI checker, and the two riders were turned into Security for loose talk. Talk about work outside the plant fence, even in the Oak Ridge fence, was much discouraged.

There was a call a few days later for a private meeting with a security officer. The meeting did not go too well. There was some comment that the security system was not too well designed to help get the job done and to keep a secure city really secure and that if those who ran it worked as long hours as those getting the real job done things would be better all over. This did not go over too well, and the officer offered the alternative of less loose talk or a job in the army fighting the Japanese hand-to-hand in the South Pacific, with mail censored both in and out, as the alternative. The guilty got the point and said they were sure that they could do better.

Chapter 5: Some Junior Chemist Experiences, Summer of '44 to Summer of '45, Part II

There were extensive central development laboratories, local production area process laboratories like the BT lab, and a Process Improvement Group at work at making things better. With the combination of security rules and the communication problems, things did not always go as the organization chart said. The head of PI came to the BT lab one day, saying he could not get the help he needed for data on the peroxide precipitation process that he thought would be best for the expanding enriched-uranium Beta recycle. He said he had heard the BT laboratory was working on the peroxide precipitation, and could he get data for his application? The Cold Peroxide Precipitation Process for Beta with collection in criticality-safe four-inch-diameter high-speed centrifuges quickly resulted from this extra BT Lab effort.

Decades later the PI head was asked how it was that he came to the little BT lab for help. He said that one day he dropped in on the head of Chemical Production and found him sitting at his desk, head in hand, staring off into space. PI head asked CP head what was wrong. CP head said, "Nothing really", but he was mystified. Some recently graduated, obnoxious kid had hired in off the street who unexpectedly knew more about the processes in the plant than his crew that had been working on it for a year, and he did not understand it. PI head decided to take a chance.

The extension of 9202 was being finished in the fall of '44 and the crew was being trained. There was a pleasant new shift supervisor on the evening shift. He would drop over to the laboratory in the old BT to discuss how the improved processes were coming along, and would want to gossip about how the overall project was going, and was wondering what an atomic bomb might really look like. He was interested in having "part" of the crew over to his house for Thanksgiving and Christmas, with drinks (illegal in town) and conversation. His name was Al Slack and he, after the war was over, was found to be a Soviet spy and got thirty years.

There is an interesting story about the head of the chemistry department from Brown University. He was developing new ethers that would extract uranium as the nitrate, and also have high boiling points, one being the Dibutyl Carbitol that we still use. On his first visit to the area he came with his brief case that doubled as a bar. In the search at the gate, he was told that he could not come into the military reservation with his brief case bar. He called the commanding officer of the area and set down a rule - no brief case, no visit. He and his brief case visited. [Ed. note - this is reminiscent of the story about Charles Steinmetz and his cigar ("No smoke, no Steinmetz")]

There were a lot of people from all parts of the project in the dormitories. The usual conversations gave continued information about scattered details of the project which could be put together. Before long the nature of the progress being made was obvious to many of those who worked at the technical level of the project.

At the dormitory there was an interesting engineer in the next room named Joe. He was short and round and sixtyish and liked to stay up late to talk. He was interested in things technical, especially the technology of filtration systems. It seems that he had been a representative of the Oliver United Co in filter sales and technical service to the sugar industry involving both beets in North America and cane in South and Central America. He was full of the tales of how, in the course of his activities, he got involved in dealing with complex technical problems in the industry and even got involved in helping solve a Central American revolution or two. Most of what he said made technical and historical sense. A lot about filtration technology was learned. A lot was learned about the Alpha Calutron units and their vacuum- tank face-plate problems along the way.

It was also obvious that Joe was angry at his old company for some reason and did not want them to know where he was. A secret city seemed to fit the bill for him to hide in. After the war he was going to retire to his cabin in the Rocky Mountains above Trinidad, Colorado.

There was a need for a filter, and one of those contacted was a sales person for Oliver United. During the conversation he was asked if an interesting person named Joseph Valentine Zentherfer might mean something to him. He was visibly taken aback and said that the man was a legend and the things that he had done often seemed to have been the impossible. The sales person wanted to know where Joe was, and was told that it was not possible to say. A few weeks later a personal letter from the president of Oliver United was received for delivery to Joe. The content and effect of the letter were never revealed.

The filter was obtained, and used to collect the uranium peroxide that had been made filterable by the use of flocculation agents and controlled precipitation. This replaced the continuous horizontal Bird Centrifuge that had been used before. Now, the settling and filtering allowed more production and the better washing of the cake on the filter improved the purity of the product. The production rate of the old BT facility was rising and the 9202 extension was about ready to be used. Buildings 9207, 9208, 9210, 9211, 9769 and others were designed and ready for construction.

This new complex of buildings was designed to use the process with the improved peroxide precipitation procedure, but incorporated the old high pressure chlorination and the sublimation step for the preparation of the uranium tetrachloride feed. The whole process was designed to be critically safe by batch size control with sequence-controlled valving to prevent double- batching. It also used safe geometry for chlorination and sublimation, because it was expected to be operated with 3.5% 235U feed from K-25. The complex was never finished because K-25 went beyond that assay, but the laboratories were ready to use in the winter of '44-'45, 9 months after they were designed.

The uranium hexafluoride was to be received in 9211, dissolved in water, precipitated as the ammonium salt and then as the peroxide to go to 9207, and then to be calcined under reduced pressure in safe-geometry rotating equipment heated with megahertz induction heating. The oxide was to go to the west end of 9207 where it was to be chlorinated with carbon tetrachloride under pressure in safe equipment, and then to 9210 for decomposition and sublimation, again in safe equipment.

The 9202 extension had been designed around the old Bulk Treatment process, with the iron hydroxide and ammonium cake collected in large basket centrifuges and the peroxide on the rotary vacuum filters, before discharge into the vacuum dryers and then the calciners. The precipitation vessels were 750 gallons rather than the previous 250 gallons, the settling tanks were several thousand gallons, the piping and valves were ceramic rather than metal, and the gaskets were the Teflon™ of the period.

There was a small hex conversion unit in the west end of the 9202 extension, where conversion to the trioxide by way of the ammonium precipitation, peroxide precipitation and calcination were performed. The extension was eventually operated on slightly enriched uranium, 0.8 and 0.9 percent 235 from the thermal diffusion plant at S-50 and the diffusion plant at K-25, beginning in the late summer of 1944. S-50 went down as soon as K-25 got to these assays.

The production line in the old equipment was modified to use an adaptation of the direct peroxide precipitation of the uranium from the machine wash solution. Instead of the use of cold solutions from the beginning, the initial precipitation was done at room temperature and the batch was cooled and aged as the excess of peroxide was added, to get the lowest practical uranium concentration in the filtrate. This also helped in the flocculation so that the material would settle and filter easily for high production. This process was a direct scale-up from the four-liter beakers on the bench top to the 250-gal vessels, with little change in the nature of the process results.

By early fall the extension was running and the process there was being revised to the direct and then the cold peroxide precipitation, to increase the capacity of the plant. There were interesting problems, because the nature of the agitation in the 750-gallon tanks was different than in the 250- gallon ones, so that the process that scaled well from beakers to the 250- gallon size did not scale as well to the 750-gallon vessels. Continued work got the desired production levels.

There are hazards with peroxide processes other than the delicate nature of the crystallization process of the uranium precipitate. One pleasant day in the spring of 1945, the author was standing in line at the cafeteria (now housing Technical Library) for a chance at a noon meal. He and Ted and Tom had come down from the new laboratory in the partially finished 9207. The line extended down the road as it always did near noon. During the morning of this day there had been an accident in the 9202 extension. The hydrogen peroxide head tank to one of the reactors had blown its vent, apparently because incorrect valve operation on the manifold that fed the peroxide to the vessel had backed some of the feed solution into the concentrated peroxide in the head tank, and caused its rapid decomposition. Some of the peroxide had been moved to a large storage tank that was supposed to be clean, but it was not.

Standing in line, a loud whistle was heard and the head was turned just in time to hear a bang and see some of the concrete roof sections of the 9202 extension lift off and settle down in the yard. The storage tank had blown its top. Fortunately no one was hurt, but the author spent a lot of time in the new laboratory in 9207 determining the kinetics of the decomposition reactions of hydrogen peroxide contaminated with the feed solutions. His report for the week contained descriptions of a number of experiments that ended with the words, "...the apparatus exploded".

During the '44 and '45 period there were security people that came around to ask what you knew about the project and how well it was going. Since the object had been obvious from the first day of work and the work involved the basic feed to the facility, much added information could be derived. These folks always seemed to be amazed that a lowly junior chemist was current with the production and efficiency of the facility with no access to the official output data. This happens when one is in control of the plant feed and you can guess the losses.

The Summer Vacation of 1945. Some enriched material in the high-twenty-percent assay level had been received from K-25 in July for direct feed to Beta through 9206, which now did the Beta recycle. The solid hex was being dissolved in a water solution of aluminum nitrate, and the precipitation was made directly with peroxide for oxide feed to the chlorinators in 9206. The project was obviously going well in the summer of 1945, and the author asked for his first vacation for the end of July and the first week of August. One could arrange for a plane, a DC-3, to Washington D. C. and a train to Lewiston, Maine to see the folks. The high temperature in Maine that week was 69 F, not the 97 F of Oak Ridge, and the old major professor, when visited in the lab looked up and said, "We have some samples from the Androscoggin River to titrate for BOD related to the pollution control effort with the paper industry", an old project of his. He did not seem to understand

that I had been gone to a new and very different world for over a year and that he could not be told.

There had been an item in the paper (before the vacation) that talked about a large munitions depot explosion in the West that lighted up the whole of the Southwest of the United States on July 16th, and we thought that we knew the real story behind this [cover] story. It might have been one of our products. Just a few days after the event, and the cover story, a meeting of the technical staff was called and it was explained that the plutonium device had been successful, but without much elaboration. We in Y-12 knew little about this plutonium material (that was an X-10 problem) and we wondered about all that uranium-235 we had been delivering in quantity to Los Alamos over the previous couple of months.

The answer was found in the headlines of the newspapers in the railway station in Washington, D.C., on the way back from that first vacation. Hiroshima was largely gone, with one plane and one bomb, and it was said that uranium-235 from Oak Ridge, Tennessee, had been used. The Junior Chemist missed the celebration that took place in Oak Ridge by a day.

PUBLICATIONS INFORMATION. A few years ago Alicia Compere and Bill Griffith compiled John's publication list for the years 1944-80. This shows 103 items, the majority of which (in the early years, especially) showing him as principal or sole author. The single most prolific year was 1945, with 25 reports; after the war years there was a classic cyclical pattern with some years having numerous publications and some years not. Internal reports constituted the majority of his formal output, with the occasional highly significant outside publication, such as the Zr/Hf separation work.

What is impossible to accurately document is his output of position papers on many, many topics. These relate to plant operations, proposed processes, troubleshooting, technology issues of national concern, and intelligence issues. Each one of these informal papers was thoroughly thought out and typically were written at the level of a short communication to a refereed journal.

If anyone is interested in the detailed list of John's publications, contact the FYI editors.

RCRA.

Googin was watching out for our welfare when this was first published in the FYI in November 1989. It is something that should be stressed and remembered.

GOOGIN'S CORNER

RCRA - Rules, Regulation, and Retribution

We have had several opportunities recently to learn about the nature of the risk that comes to those who deal with materials classified as RCRA in an industrial setting. The RCRA objective is the conservation of any and all resources. A mechanism used to force the conservation is control through definition of the materials as hazardous in some way. Potentially this control will involve almost everyone and any chemical except pure water. These rules and regulations are applied in a very uneven way. At work acetone is a listed material because it has a low flash

point. In the public sector it may be purchased at a paint store and used and disposed of as one sees fit. At work it must be disposed of by a RCRA-approved series of steps, containers, times, places, and final disposition, or a crime has been committed. We must be prepared to do it all at work even if only the safety essentials at home. Of course, if the acetone at work must be diluted to less than a ten percent solution in water by the nature of the process, you might be at the moment free of the RCRA rules.

There is growing, successful, campaign by the Department of Justice to use the stringent criminal penalty terms of the Resources Conservation and Recovery Act as the best tool at hand to enforce many of the rules that are needed under several of the laws that are intended to protect the environment. The tactic taken has been one of enforcing to the strict letter of the RCRA law, rules, and regulations with little regard to the common sense of the rule or the basic intent of the law. The as yet unresolved saga of the Rocky Flats Plant is potentially a classic case in the resolution of the objectives. The DOJ tactic has been taken because it is possible to get "criminal convictions" of individuals under RCRA. The tactic has been taken because criminal conviction of individuals is sure to get the attention of everyone involved because all are at risk individually, not just the company. All who should know better are guilty unless they have taken acceptable action to correct a problems in a timely way under the regulations. This guilt starts first with the lowest level person who should be adequately trained by education or experience and extends upward in the organization to include all those who might be demonstrated to have had the knowledge and ability to stop the transgression and did not. It will be a long time before we can be sure that we and the EPA and DOJ have learned enough about the real problems because the rules for the areas of concern are still changing. The convictions and appeals have yet to establish the limits of the laws. The list of materials involved will continue to expand so what is legal today may get you a jail term after a new regulation is promulgated tomorrow. The most famous, and perhaps the most useful, of the more than 300 cases that have resulted in criminal convictions of individuals, are those involving three people at the Aberdeen Proving Grounds of the U.S. Army. These three people were the skilled chemical engineers involved in the perfection of the dual base nerve gases to be used in the "safe" deployment of this weapon. It would become dangerous only when the two components were combined at the last moment. The safety effort which created the problem was done in old and decrepit pilot plant facilities for the purpose of finding "safe" methods for handling the synthesis and loading of the needed components. The case might have been made that the effort to be "safe" was itself unsafe. Those involved are some of the most respected professionals in the country and well liked in their communities. These people made the mistake of preparing paper records that said they were familiar with the requirements of the RCRA rules and that they were committed to follow them and then did not follow through. This paper trail came as a result of the management system of the facility. These commitments to become trained and to train others in the nature of the rules and regulations were not carried out by the individuals. They were in the position of being familiar with the basic hazards of the materials they were in custody of, but of not becoming familiar enough with the new rules,

and of not having taken the time to devise ways to be safe and practical using the facilities and services that were at hand within the letter of the rules. They had been informed by the proper people on site of the suspect nature of the way in which they were storing and disposing of listed materials. There were statements in the record to the fact that they had been informed of the error of their ways after a special investigation. It was in the record that they had avoided detailed investigation of their problem by use of their positions to discredit criticism.

When the need to dispose of the materials became obvious to them, they proceeded as though it was still their privilege to define what was safe and what was the proper disposition of the substances. The prosecution never made the case that they did anything that caused serious damage to the people or the environment. They were prosecuted and convicted on the basis that they did not follow the prescribed rules for RCRA-listed materials like ethylacetate and ethyl ether. The three were in a management line and those above escaped because the top of this line of three did not make those above aware of the problems.

Because a criminal case was involved, they were forced into the position of having to bear all the costs of their defense as individuals. This will be the case in all such cases and there is no insurance that will protect against the financial loss. Those involved at Aberdeen are now bankrupt, have been sentenced, and are on parole waiting for the results of appeals.

There are a long series of protective actions against RCRA convictions that are implied by what has happened so far. Some useful ones are:

1. Be sure to understand the RCRA rules that apply even if they do not appear to make logical sense.
2. Be sure to follow the rules and report up the management line immediately if following the rules is not possible.
3. Be sure to get any exception signed off by higher authority so that you are not the potential guilty ones.
4. Be sure to keep signed and dated copies of papers related to policy and procedure decisions made. Records on simple disks may not be good in court.
5. Be sure to keep copies of those papers related to questionable events you have been involved in when you leave. Criminal individual guilt will follow you.

From Dr. Googin to Us, His Famous Hot Meal Recipe *Y-12 Heavenly Oats, No Lost Time, Lunch*

Begin with 1 cup of VERY hot water (this may be heated in a Microwave

Add 1 1/2 oz. packet of Instant Cereal (oat meal is good!)

Stir

Add 3 heaping teaspoons of Instant Cocoa, kind for adding to water

Stir

Microwave to Desired Consistency.

Your FYI editors are Kimberly Myers and Jon Bullock. Special thanks for help with this issue goes to Audrey Windham, Helen Claffey, and Ron Simandl. Your PID team members are Gene Bird, Bill Brosey, Jon Bullock, A. J. Colby, Lynn Glover, Charles Kee, Harry Lanauze, Kim Myers, Arnetta Peters, Chris Pickett, Sam Robinson, Sylvia Sterling, Felbert Thompson, Vic Upchurch, and Jerry Whittaker.

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