# History

# of the


# USDA-ARS

## Pasture Systems and Watershed Management Research Unit

## and letters from former employees

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The U.S. Regional Pasture Research Laboratory, located on the campus of The Pennsylvania State University, was the second of nine regional laboratories established under Title I. Section IV of the Bankhead-Jones Act approved June 25, 1935 by the U.S. Congress. The Pasture Laboratory was conceived to serve as a focal point for basic research in pasture improvement and to encourage cooperative research in solving pasture problems in the northeastern United States. The cooperative efforts among personnel in the U.S. Department of Agriculture and the 12 northeastern states (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland and West Virginia) are documented in the initial Memorandum of Understanding between the U.S. Department of Agriculture and each State Agricultural Experiment Station. This document, dated March 1, 1936, directed those personnel to obtain, through basic research, the technology and materials useful in pasture improvement throughout the northeastern States, and to facilitate the utilization of these facts and materials for the benefit of agriculture in the northeastern States. The initial Memorandum stressed that research in pasture improvement be conducted by the various State Agricultural Experiment Stations and be integrated with the research of the U.S. Regional Pasture Research Laboratory. A second Memorandum of Understanding, dated November 1, 1957, reaffirmed the coordination of research to be accomplished at the Laboratory and to promote effective cooperation in grassland improvement research. It focused on the importance of grasslands in the northeastern States and the need for cooperation and coordination of efforts to cover the broad field of plant, soil, and animal relationships in the improvement of grasslands.

Construction of the Pasture Laboratory began during the summer of 1936 on land deeded by the Pennsylvania State College (now The Pennsylvania State University) to the United States Department of Agriculture. A two-story brick building for offices and laboratories, an adjacent headhouse, and three attached greenhouses were completed and the building occupied on July 1, 1937. About 40 acres approximately 1½ miles from the Laboratory were made available for a breeding nursery. An addition to the original structure was begun in 1969 and completed during 1967. This new addition provide 80 percent more office and laboratory space. Another headhouse and one of three proposed greenhouses was erected in 1972 on The Pennsylvania State University campus about one mile form the Laboratory. The University also assigned approximately 50 acres of land at the Rock Springs Agricultural Research Center to the Laboratory. This acreage, located three miles west of Pine Grove Mills and 10 miles from the Laboratory, provided much needed land to conduct research on forage crop improvement. Use of this land began in 1967 and also that year a building was erected at the farm site to house farm machinery and facilities for drying forage samples from the field plots. Three additional buildings have since been constructed.

Dr. R.J. Garber, an agronomist, was appointed first Laboratory Director. The original staff, including the Director, numbered seven scientists, and included the disciplines of agronomy, plant physiology, biochemistry, soil science and genetics. During following years, the disciplines of plant pathology, entomology, animal science, agricultural engineering and ecology were added. The Pasture Laboratory was initially administered by the Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils and Agricultural Engineering, U.S. Department of Agriculture. Administration is not through the North Atlantic Area, Agricultural Research Service, USDA.

One of the primary purposes for establishing the U.S. Regional Pasture Laboratory was to serve as the focal point for forage research in the 12 northeastern states. In order to stimulate cooperative research, a board of 12 collaborators was created, with one representative from each of the 12 states of the northeast region. These collaborators were selected so that different fields of research were represented in the planning, coordination, and integration of fundamental research. The collaborators reviewed research projects and exchanged information. The carried out their function regardless of whether the work was supported by state funds, federal funds, or both. The first collaborators were appointed in 1936, and meetings, which were started in November 1937, continued on an annual or biennial basis until 1973.

The Northeast Watershed Research Center was authorized by Congress in October 1965, and established in 1966 in pursuit of the goals stated in Senate Document No. 59 (1959) and entitled, "Facility Needs—Soil and Water Conservation Research." The stated major purpose for the Watershed Research Center was to gain basic information for the guidance of programs for the control and use of water and stream channel systems in areas where agricultural, urban, and municipal use of soil and water must be given consideration on an integrated basis." The distinguishing need stated was the "meager research information for the planning, design, and application of watershed protection programs in the New England area". The "watershed protection program" primarily referred to the 1954 Watershed Protection Act which gave the Soil Conservation Service, now renamed the Natural Resources Conservation Service (NRCD), the responsibility and authority to control floods on small watersheds. The document also stated that "the research needs of greatest urgency in watershed engineering were precipitation-runoff relationships, sedimentation, channel stability, and sedimentation of valleys.

In 1992, the Pasture Laboratory and Watershed Research Center were merged to form the Pasture Systems and Watershed Management Research Laboratory. Although the merger took place on paper in 1992, the physical merger was not completed until 1994. The merged unit now resides in the original Pasture Laboratory building.

The original mission of the Pasture Laboratory was to investigate fundamental problems related to improving the productivity of grasslands in the northeastern United States. Over the years and with the merger with the Watershed Research Center, this mission has expanded to include, at times, investigations of biological, chemical, and environmental problems which are involved in the production and utilization of forage and other crops. In recent years, a major focus has been on conserving the region's soil and water resources to ensure the sustainability and profitability of northeastern U.S. farms. Basic and applied investigations have included animal nutrition, biochemistry, chemistry, community ecology, cytogenetics, genetics, plant breeding, entomology, forage management, hydrology, microbiology, model development, plant pathology, plant physiology, the environmental fate of soil nutrients, and soil fertility.

The Pasture Laboratory was established with the charge to conduct basic research on fundamental problems related to forage productivity while state experimental stations were expected to focus on more applied areas such as variety development and release. However, the onset of World War II shifted research priorities at the Laboratory from fundamental problems to more immediate applied needs. With reduced availability of feeds from

Midwestern states, increased forage production in the northeastern region became a critical concern and research at the Pasture Laboratory focused on pasture renovation studies and on more rapid breeding of improved grasses and legumes. Current research at the Laboratory continues to be a mix of applied and basic research, guided by the commitment to provide timely and useful information to farmers, state and federal agencies and policy makers.

One of the most notable achievements during the history of the Pasture Laboratory was the development of controlled environment growth chambers which today are standard equipment for plant growth studies. This development began in 1940 when most of the allocated equipment funds were expended to construct four plant growth chambers. The chambers were designed by the late Dr. V.G. Sprague. Construction of the four growth chambers was completed in 1941. The chambers were designed to accommodate temperatures ranging from -5 to 45$^{o}$ C, with relative humidities of 20 percent to saturation. The equipment, as designed and constructed in 1940/1941, was the beginning of the age of plant growth chambers for studying plant response to temperature, light and humidity.

The Laboratory lists several scientists among its alumni who received noteworthy recognition. These include Dr. Helen D. Hill, the first woman to earn the Ph.D. degree from The Pennsylvania State College (University), Dr. S.S. Atwood, former President of Emory University, and Dr. W.M. Meyers, former Vice-President of the Rockefeller Foundation. Other scientists associated with the Laboratory have served as Presidents of the American Society of Agronomy, on Editorial Boards or Boards of Directors of several nation scientific societies, and as managers in ARS, state experiment stations, or private industry.

In 1950, the cooperation between the Pennsylvania Agricultural Experiment Station and the Laboratory was further enhanced by a Memorandum of Understanding which established graduate student appointments through the Graduate School, College of Agriculture, and the Laboratory. This permitted the Laboratory research facilities to be available to graduate students to pursue their research interests working in close cooperation with Laboratory scientists and department professors. While the first graduate students were supported by their respective departments, the stipends to sustain graduate students starting January 1950 was borne by the laboratory's budget as research assistantships equivalent to those offered by the College Of Agriculture.

Direct monetary support for graduate students at the Laboratory ceased in 1958. However, in 1959, graduate student training at the Laboratory was resumed, and financial support was provided through individual Cooperative Agreements between the University and the U.S. Department of Agriculture. For many years, graduate students have been an effective body for carrying out specific research projects, many of which have contributed to the status of excellence at the Laboratory.

As the Pasture Laboratory approaches its 70$^{th}$ anniversary, it continues to house a large and diversified group of permanent and visiting scientists, technical and administrative staff, postdoctoral associates, graduate students, and undergraduate workers. Successful research and the merger of the Pasture and Watershed units has led to increased budgets and an increasing number of scientific personnel until the building is bursting at the seams. Perhaps its greatest challenge for the future will be to support the growth and success of a vibrant and expanding research program.

Robert F Barnes, Research Agronomist and Laboratory Director from 1970 to 1975:

As a Research Agronomist in USDA, ARS, I was transferred from West Lafayette, IN to the U.S. Regional Pasture Research Laboratory in 1970 to serve as Laboratory Director upon the retirement of Dr. Joe Sullivan. Joe had just finished an extensive renovation and improvement of the Laboratory. During my tenure I was also designated as an adjunct Professor in the Agronomy Department at Penn State University. I especially appreciated working with Lois Smith who served as the administrative assistant. The Laboratory staff included research scientists from the Crops Research, Entomology Research, and the Soil and Water Conservation Divisions of ARS. Part of the uniqueness of the Laboratory was its role in interacting and cooperating with personnel at State Experiment Stations in the Northeast. Many cooperative projects and programs were undertaken with scientists at these institutions.

I had the privilege of working with the scientific and technical support of Guy Fissel and Bill Lynch, and was able to continue research focused on the chemical and in vitro analysis of forage crops samples as a means of predicting their nutritive value and forage quality. Research was conducted cooperatively with a number of scientists at the Laboratory, as well as personnel at Penn State and other ARS Research Units. A total of 14 manuscripts, 11 abstract presentations, 10 invited paper and/or chapters in books, and 6 invited talks were developed during my tenure at the Laboratory. I was pleased when Dr. David L. Gustine accepted a position at the Laboratory and served for many years until his retirement in 2003. David and I collaborated on preparing 3 manuscripts, 5 abstract presentations at scientific meeting and 2 invited papers and/or book chapters. I was privileged to complete at least one paper or manuscript in collaboration with Dr. Clyde Berg, Guy Fissel, Dr. Dick Hill, Dr. Ken Leath and Barton Moyer. Others that made the Laboratory a unique and productive research facility during that period were Dr. Robert Byers, Harold Donley, Charles Gross, Dr. Jerry Jung, Paul Kellerman, Dr. Bill Kendall, Dr. Bob Sherwood, Bill Stout and Ken Zeiders.

A major project I became involved in during my tenure at the Pasture Lab was my invitation to become an editor of the textbook, FORAGES. The 3$^{rd}$ ed. of the textbook was published in 1973. I continued to serve as editor for the 4$^{th}$ (1985), 5$^{th}$ (1995), and 6$^{th}$ (2003) ed. Individuals from the Pasture Lab. serving as chapter authors included Jerry Jung and Dr. R.R. Hill, Jr. Other ARS personnel coauthoring chapters in FORAGES included: Dr. A. A. Hanson, Branch Chief for the Forage and Range Research Branch, ARS, at Beltsville, MD and Dr. Gerald E. Carlson, Research Leader for the Humid Pasture and Range Investigations in ARS. Dr. Hanson coauthored the chapter on timothy in the 2$^{nd}$, 3$^{rd}$, and 4$^{th}$ ed. and Dr Carlson, coauthored a chapter in FORAGES on white and other permanent clovers in the 4$^{th}$ ed. Jerry Carlson had received his PhD while working at the Pasture Lab. under Dr. Vance Sprague and originally invited me to consider the position at the Pasture Lab. while he was serving as my supervisor in the late 1960's. During my initial tenure at the Lab., I reported to Dr. Hanson as Branch Chief. Collaborators at Penn State writing FORAGES chapters included: John Baylor and John Shenk, Agron. Dept. and Lowell Wilson, Animal Science Dept.

With the reorganization of ARS in 1972, the roles and responsibilities were changed and the added responsibility of Location Leader was established. A primary emphasis was an attempt to maintain and enhance the integrity of individual scientists and their ability to work together in teams to address relevant problems.

One of the highlights for me was when I became involved in research with Karl Morris, an ARS civil engineer at Beltsville, MD. Forage samples with chemical, in vitro and in vivo values developed by research in FL, PA and IN were analyzed by near infra-red reflectance spectroscopy (NIRS). The research results documented the efficacy of NIRS as an effective predictor of forage quality in 1975. A core group of the available forage samples were those brought from my research efforts in West Lafayette, IN. Key collaborators were Dr. John S. Shenk, Penn State, who went on to specialize in NIRS technology, and Dr. John A. Moore, Florida State, in addition to Karl Norris. As a consequence of this work, I was among the recipients of the USDA Award for Superior Service presented to the National NIRS Forage Research Group, ARS, Athens, GA. The citation was "*For an exceptional team research effort in the development of near infrared reflectance spectroscopy as a system for the rapid measurement of the nutritive value of forages and foodstuff.*"

I was appointed as the ARS National Program Scientist for Pasture, Forage and Range Research in 1975 and was transferred to Beltsville, MD. In 1979, I was transferred to New Orleans, LA where I served as the Associate Regional Administrator and Regional Administrator for the Southern Region until my retirement from federal service in 1986. I then served as the Executive Vice President with the American Society of Agronomy, Crop Science Society of America and Soil Science Society of America in Madison, WI until my retirement in 1998.

Bob Barnes now resides with his wife, Bettye, and their son, Brad, at 5518 Hammersley Road, Madison, WI 53711-3557; phone: 608/274-9273; and his email address is rbarnes@agronomy.org.

Clyde Berg written by Rebecca Berg

Clyde and 1 came to the Pasture Lab in April, 1966. This was his first and only job after he completed his Ph D.

At the time we carne, the lab was quite small and was a close-knit family. Joe Sullivan was the director. He and his wife and Dick and Jean Hill really made us feel welcome and helped us learn the ropes in and around State College. Soon after we arrived, Ken and Marie Leath arrived and also Dave and Diane Gustine. We all had young families, so picnics in Sunset Park were lively affairs.

Clyde called himself a grass breeder, and distinguished that with the kind the cows eat. Harold Donley was his technician when we first came. They worked closely for several years. Clyde also worked quite closely with Arnie Hovin and Bob Sherwood. Bob Oberheim was one of Clyde's graduate students and they remained friends from then on. They played on the same volleyball team over the lunch hour some of the time.

Steve LaMar told me just recently that Clyde is talked about quite frequently at the lab with fond memories.

After Clyde retired, we took several nice trips to visit our kids to see some of the U. S. When we came back from those trips, Clyde would often stop by the lab and visit with the scientists and technicians. Thanks for including me in this celebration.

## Bob Byers

The day after Lisa (our daughter) was born I received a telegram asking if I wanted to be considered for a position with ARS at Tifton, Georgia at GS-9. I was really excited about it and sent a reply. Two weeks later I had not heard that the tentative starting date Sept. 5 was still good. On Sept. 4, my wife's cousin and I towed a u-haul to Tifton and I showed up for work on Sept. 6, 1961. Pat was unable to come with me because she had a kidney infection and couldn't travel in a car. She flew down the following week. It was her one and only plane trip and hasn't flown since. She arrived in a red dress with a big spot near the top where Lisa threw up on the plane. It gets better. Our first paycheck, which was to arrive in about one month, never came. We were down to our last dollar. My supervisor was out of town on vacation so I had nowhere to turn. The next week my supervisor returned and when he found out my plight, he wrote me a personal check for $100 and then chewed out the administrative assistant for failing to turn in my time sheet to the finance center.

Despite this crazy start I enjoyed my first assignment studying the biology of the two-lined spittlebug, which was a pest of coastal bermudagrass, the leading forage in the South. Homer Wells and I discovered how the insect destroyed the grass by causing a phytotoxemia. Later scientists in Colombia and Brazil discovered our work and found it applied to spittlebugs on their pastures causing similar problems. During this period several of us at Tifton visited the range cattle research station in the everglade region of Florida to talk about spittlebugs on their pastures. I'll never forget that trip, my first to Florida. To get to the station we went to Ona, Florida, a poke and plumb town with a small post office painted pink! I kid you not! The road through the pine forest ended at the range cattle station where there were enormous open spaces with pastures, cattle and several buildings and some houses where about 20 staff lived. Our host said he lived there for about 20 years. Talk about back in the boondocks! They were at least 25 miles from the nearest city, which wasn't much to crow about! We were certainly glad to get back to Tifton, and civilization!

After about five years at Tifton, I realized it would be better for my career advancement to get a PhD. Frankly I was apprehensive about whether I was capable of getting the degree. At the time I was cooperating with Charles Taliaferro, a new PhD educated grass breeder from Oklahoma who also was working for ARS. We were about the same age. One day I got up the nerve to ask him how hard it was to get a PhD? He didn't answer for a minute then said, "It is just like getting a Master's degree, and you just go longer." It was a revelation to me and it was at that moment I decided that my future was to try and get my doctorate. Six months later I transferred to Purdue University and spent the next 3 years and 9 months working on the Hessian fly. My thesis was on the insect plant interaction that explained how the fly larvae were able to stunt wheat plants. My supervisor and I published three papers from this work. The insect damaged the plant by upsetting the growth hormones in the plant by shifting the balance to plant inhibitors. The plant them inhibited its own growth. This was advantageous to the insect because it could live behind the leaf sheath on a stunted plant stem in a small gall. On Hessian fly resistant plants that did not stunt, the insect was lifted upwards by the elongating stem and exposed to the environment and perished.

One summer at Purdue, Bob Gallun my supervisor, wanted me to check out a system he was using to determine the distribution of Hessian fly in Indiana. Farmers would send wheat plant

samples to us and we would take penknife in hand and whittle stems looking for “flaxseed” the common name of Hessian fly pupae. We would find lots of infested samples but had no idea how badly the fields were infested where the samples originated. My job was to go to the farms that had infested samples and survey the field by a random sample of the wheat stubble and bring it back to West Lafayette and look for flaxseeds. The wheat had been harvested before I got to check the infestations because of the time to process the original samples. I visited a great number of farms all over Indiana. The conclusion of the work showed that if we recovered a flaxseed in the original sample, that field was usually heavily infested with Hessian fly. We then recommended a resistant variety to be planted the following year.

One day at the end of my thesis work I received a call from the branch chief R. G. Dahms. He recalled I had expressed an interest four years before of replacing the entomologist at the pasture lab when and if he ever retired. He wanted to know if I still was interested? My reply was No S..t!!! He laughed and said I’ll take that as a yes! Never in my wildest dreams did I think I could come back to Penn State! I arrived here in 1970 about a year after that conversation with Dr. Dahms. They waited that long for me to finish my degree to fill the position. I felt honored and lucky to be at the pasture lab, my dream job. However, the budget was tight in the early seventies and there was little money after salaries for research. After five years of bumping along with no technician, I decided to visit the regional director in Beltsville. I made an appointment but didn’t tell him why I was coming. When he asked what I wanted, I replied one of two things, some money to do research or a transfer to someplace where I could! I think he was sort of startled but I got it off my chest! Two years later Bill Templeton became our director and the money flowed in. I hired my first technician in 16 years and the lab flourished. Bill was a proponent of no-till establishment of forages and together we tackled the major deterrent to no-till establishment of legumes – slugs and insects. In a short time we took the lead in slug work in the US. Bill talked me into organizing an international symposium on no-till problems. We invited scientists from Europe, South America, Australia and New Zealand. Only problem is we had no money to pay the airfares for guest speakers. The administrators in Beltsville sort of promised to help but failed to release funds. We had an emergency-planning meeting to discuss strategy. Charlie Pitts, head of Entomology at Penn State made this comment, “I’ll bet we would have the money in our hot little hand if we put one of the administrators as a keynote speaker”. I said, “Great let’s do it”! When the associate area director was made keynote speaker, the funds were released the next day!

While we were working on no-till research we made an interesting discovery at the research plots located at the Jefferson County extension center near Brookville, PA. This is in county that harbors the groundhog “Punxsutawney Phil”. We arrived to harvest some forage plots one day and discovered some wild animals had eaten all the red clover from the plots. It was so short there was little to harvest! Bill Templeton suspected groundhogs. They had made paths through the birdsfoot trefoil plots, never touching those plants, to get to the red clover! A little later that day our technician Harold Donnely returned from Brookville having a problem fixed with our big truck used to transport the harvesting equipment. He told us a story. Seems the mechanics at the garage wanted to know if we were the ones with plots near the extension center. He said that’s us! The mechanics said it was a great place to hunt groundhogs. Harold asked how many did they shoot. They replied 48! No wonder we had no red clover to harvest! Ah, the idiosynchrasies of field research!

As a result of the international symposium on no-till I had the chance to go to New Zealand to visit their no-till work. I visited three research stations in 1993 and met Gary Barker on the second week of the trip. He was during a survey of pasture invertebrates. I said we should do this in Pennsylvania! Gary immediately replied, "I would be keen to come help you!" Well to make a long story short Gary came over twice and we cooperated for the next ten years on a survey of Northeastern pastures. It was a wonderful experience traveling to dairy farms all over Pennsylvania, New York and Vermont. We even had an English scientist, Phil Murray go on field trips with us for about a week. While he was in our van traveling backcountry roads from one farm site to another we had a close call with a bridge. Steve LaMar was driving. The sign said one lane bridge ahead. Usually you move over to the middle of the road to cross these bridges. Well, Steve kept right and everyone in the van yelled look out! We are going to hit that stone bridge! Phil Murray turned white as a ghost! We missed the wall by inches! Steve was undaunted and said we had plenty of room and it wasn't even close. I'll bet this story is told to Phil's kids in England how Daddy almost bought it on a backcountry road in Pennsylvania!

Three years ago on ground hogs day I retired from ARS. It was a wild ride with ups and downs but on the whole enjoying and fulfilling. Steve organized my retirement party for which I will be eternally grateful. John Everhart gave a speech that touched my heart. I moved about 50 yards to the west and have been working at the Frost Museum ever since and enjoying every minute. Thanks for allowing me to share some moments with you. Happy 50$^{th}$ birthday ARS!

## Guy W. Fissel

I was born in Biglerville, PA, on June 4, 1929, the youngest son of four boys and three girls. My father was working for the State Highway Department. He had worked as a carpenter, a furniture factory worker, a bread truck driver, and a farmer. After blood poisoning left his left hand crippled in 1937, he fired the boiler for Duffy–Mott Canning Co.

I worked in the fruit orchards in Adams County with my mother, brother, and sisters. I finally stopped working in the orchards when I was junior at Penn State due to summer duty with the Army ROTC program.

In 1947, I attended Shippensburg State Teachers College, because Penn State had so many veterans enrolled that there was no room for freshmen. In 1948, I arrived at Penn State and enrolled in Agricultural and Biological Chemistry. I graduated with my BS in January 1952.

Due to the Korean War, all ROTC cadets were called to active duty. My first duty was at Ft. Monmouth, NJ, to attend Basic Signal Officers School. From there I went to Ft. Holabird in Baltimore to attend Signal Supply School. After graduation, I was assigned to the Baltimore Signal Depot. Two months later, I went to Ft. Monroe, VA, as Post Signal Supply Officer and Assistant Post Signal Officer.

While at Ft. Monroe, I got married. Shortly thereafter, I received orders to go to Korea. In Korea I was assigned to the 51$^{st}$ Signal Battalion, 1$^{st}$ Corps. We were about seven miles behind the 1$^{st}$ ROK Division. After the Armistice, I applied to Penn State for graduate school. I was accepted and left Korea in early December 1953.

My MS thesis was on softening agents for Lycopodium (ground pine), which is used in making Christmas wreaths. After receiving my MS degree in August 1955, I was hired by United Fruit Company as a chemist for their Research Laboratory in La Lima, Honduras. While there, I worked on sprays for the control of leaf spot on bananas.

In 1956, Joe Sullivan, chemist at the Pasture Research Lab, told the head of the Ag Bio Chem. Dept. that the USDA was looking for a chemist for the Humid Pasture Lab in the Forage and Range Research Branch at Beltsville, MD. I was told of the opening and was hired in Jan. 1958. While there, I analyzed forage and feces for carbohydrates, fat, and protein.

Joe Sullivan retired in 1969 as Director of the Pasture Lab. Bob Barnes came in from Purdue to take over as Director. He needed a chemist to analyze forages for his in vitro digestibility research, so I was transferred from Beltsville to the Pasture Lab in July 1970.

A graduate student of Barnes at Purdue isolated something from crownvetch that affected the growth of meadow voles. John Shenk, in the Penn State Agronomy Dept., established a meadow vole colony at Penn State. Young meadow voles would lose weight and die when fed crownvetch. I extracted crownvetch with ethyl alcohol. I then added the crownvetch to the maintenance diet, and the meadow voles gained weight. When the alcohol extract was added to the maintenance diet, the meadow voles lost weight and died. Dave Gustine then identified the substance that killed the meadow voles. This substance also prevented cattle from thriving on crownvetch.

Karl Norris, at Beltsville, was using Infrared Spectral Analysis to analyze grain. Bob Barnes and John Shenk thought that it might be developed to analyze forage.

I chemically analyzed forages and then ran them through the Infrared Spectrometer. Bob Barnes was transferred to New Orleans before the method was fully developed for forage analysis. John Shenk and Bill Templeton (Pasture Lab Director) finally got Infrared Spectroanalysis accepted for forage analysis.

The last few years before retiring, I worked with Jerry Jung analyzing dry season forages that were fed to sheep and the sheep feces to determine the digestibility of the forages.

After retirement in 1991, I have helped my children with house repairs. My wife and I have visited our children and grandchildren. My garden keeps me busy in the summer growing most of the vegetables my wife and I need. In winter, I use my snowplow to plow sidewalks and driveways for five of my neighbors.

I thoroughly enjoyed the twenty-one years that I worked at the USDA Pasture Research Laboratory.

## U.S. REGIONAL PASTURE RESEARCH LABORATORY

Charles F. Gross (employee 6/1955 – 7/1979)

Little did I realize nor anticipate what a gratifying and interesting research experience awaited me as I began work with Dr. Robinson's department in June 1955. One of my very first impressions of the Pasture Lab was of the diversity of the agronomic programs that were being followed and entailed studies concerning grass and legume physiology, pathology, and genetics including our own field and greenhouse experiments.

I was fortunate in that I had three other leaders in my department under whom I worked after Dr. Robinson retired, namely, Drs. Rhykerd, Wilkinson and Jung all of them pleasant knowledgeable researches and I learned much from each of them. I always considered the Pasture Lab a rather unique place in several ways. One of the reasons for this could be the general spirit of cooperation that existed amongst the researchers. For example, if I had a statistical problem that needed resolving in an experiment Dr. Richard Hill was always willing to help me with his suggestions.

In a lighter vein, I came to know much of the topography of Pennsylvania as well as the diversity of the insect population (e.g. biting and stinging flies) participating in Dr. Gerald Jung's many and scattered field plot trials.

I believe we could not have accomplished much of what we did without the energy, ability and knowledge of the technicians such as Robert Kocher. The Pasture Lab office staff was very efficient and helped us with our technical write-ups for publications as well as the required governmental "paperwork".

## Dave Gustine

I came to the USDA Regional Pasture Laboratory in 1971 with the objective of spending five years in research and using that experience as a stepping stone to a better, more exciting job. Other than a ten-month sabbatical in Albany, CA in Tony Waisses' lab at the USDA Western Regional Research Laboratory, I stayed here. I found this research environment at University Park stimulating and very satisfying, and perhaps more importantly, I found State College an ideal place to grow a family and set down roots.

I was recruited by Bob Barnes, the Laboratory Director at that time. I graduated from Michigan State University with my Ph.D. in plant biochemistry and moved to Cincinnati, OH for post doctorate experience in animal biochemistry, where I worked with developmental disorders in mice. Realizing then that plants don't squeal, bite, kick, or bleed, I was ready to get back into plant research. When Bob offered the job after interviewing me in Cincinnati, I wanted to jump at it. I told him I first would bring my family to see the area and come for an interview at my own expense, because I could not find University Park on the AAA Pennsylvania map! The people I met on that visit in April convinced me I should take the job and bring my family to the then new to me town of State College. Among those people were Ken Leath, Bill Kendall, Dick Hill, Gerry Jung, Bob Byers, Ken Zeiders, Lois Smith, Amina Burkhart, Bob Kocher, Paul Kellerman, Bill Campbell and Harold Musser. Yes, the technicians and office help were factors in my decision. Another factor that made me feel at home at the Pasture Lab was the laid-back atmosphere tactfully brought to my attention by Dick Hill. When I met him in the hallway by the main office on the first day of the interview and introduced myself as Dr. Gustine. His response was, "Hi, I'm Dick Hill," not Dr. Hill.

Unlike interviews at the lab now, we did not meet with a realtor, nor did we look for an apartment during that trip. In telephone discussions later back in Cincinnati with Bob Barnes, he offered to check with a realtor he knew. Shortly after, he called me back saying the realtor had found a townhouse in Park Forest Village and did we want to rent it. That was the first time in my life I arranged for housing without seeing what we were buying into. We made the move in June and I reported to work on the 24th. Because our furniture was in transit, we stayed at the Auto Port Motel for a week. However, the great the people at the Lab loaned us the essentials in furniture and kitchen utensils so we could move in to the townhouse before our furniture came. After two months in my new office, Bob Sherwood arrived on the scene and about the same time, Guy Fissel joined the group. Probably the most influential scientists in getting my ARS research program underway were Bob Sherwood, Ken Leath, and Bill Kendall. From that starting foundation, I did much of my research with Bob. During my career, I published 15 research articles from the research we worked on together, as well as a few others in which I acknowledged his help.

Shortly after I started at the Lab, Bart Moyer began working for me as a technician, and three years later in 1975 he became a Support Scientist under me. He worked for me until 1995, when he was moved to Andrew Sharpley's CRIS unit. The years Bart worked for me were very productive. We started working on "deleterious" constituents of crownvetch, followed by research on induced pathogenic defense responses in clovers and alfalfa. My only graduate student, Winnie Devlin worked in the lab for several years on the role of reactive oxygen species, such as superoxide, in biochemical mechanism of plant defense in white clover and graduated with her Ph.D. in 1991. We entered the world of molecular biology

when Yannis Gounaris joined my group as an ARS post doctorate. Under Yannis' guidance, Bart and I learned the ins and outs of plant molecular biology as we tried to dissect the molecular aspects of apomixis and attempted to clone a gene for apomixis in buffelgrass. David Hulce came in after Yannis, but we were never able to break this intractable problem of asexual plant reproduction. Through those years, I published 17 research articles on which Bart was a co-author.

During those years I worked under several lab directors and research leaders: Bob Barnes, rotating research leaders until Bill Templeton came on board, Dick Hill, Rotating research leaders until Harry Pionke joined us, and Ray Bryant. Harry came to us when the old Pasture Laboratory and the northeastern Watershed Research groups were merged. Right after that, my CRIS was closed out, Bart was reassigned to another CRIS, and not long after Rick Pedersen left the lab. At that time, I was to be reassigned to another ARS location by Jim Elgin, the National Program Staff Leader in forages, and Art Schipper, the then Associate Area Director. After nearly a year of posturing to my superiors, job hunting, and career discussions with many colleagues, I was given a choice. I could work in plant molecular biology at the Richard B. Russell Laboratory in Athens, GA or start a new research career at University Park. Fortunately, I chose to stay here, as the group I would have worked for in Athens was closed out the following year. I am sure I made the best decision by remaining in State College. It was and is the place my family calls home and working in Matt Sandersen's pasture ecology CRIS was just the opportunity I needed to get a new research program going. I struggled through a two-year gap in research results getting the new program going investigating the dynamics of white clover population growth in grasslands.

I have not mentioned a number of people who worked in the lab over the years. Many technicians, students, scientists, and office employees were all good people to work with. There are too many stories I could tell and still keep this story short. These stories would include meadow voles, mice, rumen fluid, explosive chemicals, and poisonous mercuric chloride, but all research-related entities that were critical parts of my experiments. So with those stories unsaid, I conclude by saying that I had a full and happy career at the Pasture Lab/PSWMRU. I welcome any inquiries or responses to this brief historical perspective.

RICHARD R. HILL, Jr. Submitted by Jean B. Hill
USDA - ARS - over 30 years of service
March 1964 - June 1990 - Pasture Research Laboratory, University Park, PA, 16802

Without the foresight of one high school vocational agriculture teacher, Dick may have never become a plant breeder and researcher at the Pasture Lab. He was born in a log cabin and grew up on a tobacco farm near Youngsville, North Carolina. At high school graduation, his goal was to farm. Mr. Winstead, the teacher had other plans and helped secure a scholarship to North Carolina State University. So Dick could not be ungrateful and he entered college. During Christmas vacation, he realized he was eager to return to his studies. He spent the summers growing tobacco to pay his tuition.

By his senior year, Dick was working on the alfalfa project with Dr. Clarence Hanson, who joined USDA National Program Staff and moved to Beltsville, Maryland. Dick's work on the project drove him into the new world of computers as he punched the data cards and ran the analysis on the one campus computer, which filled a room. Dick completed his BS and MS degrees at NC State and spent the summer of 1961 as a statistician at Beltsville. Then he went to Cornell University where he earned a Ph.D. under Carl Lowe in the Dept. of Plant Breeding. His emphasis was genetics and statistics

In March, 1964, Dick began his work at the USDA-ARS Pasture Research Laboratory. He never lost his farm roots, enjoying planting alfalfa research plots at Penn States Rock Springs farm, Hershey Farms, and Brookville. He hauled crew and Gravely tractors to plant and harvest. One year he was really overextended and Jean was quite happy when the ground hogs took full charge of the plots at Brockway. In 1980, one of the summer crew was Geoffrey E. Brink (USDA-ARS), who spotted his daughter Marilyn and several years later became Dick and Jean's son-in-law.

With the lab location on the Penn State University campus, Dick was an adjunct member of the Agronomy Department faculty, teaching and working with graduate students. For some years, along with Marvin Risius, he taught the course in statistical genetics of plant breeding. He was the major professor on the Ph.D. committees of Neal Devos, Dawn Ames Devos, Dennis Rowe, Gary Peterson, and Nancy Ehlke, names that became recognized in breeding various plants from artichokes, garlic, and broccoli to forage crops. Another of Dick's students was Wayne Haag, who has had a career international agriculture.

Dick's heart was really in research and he served at editor of Crop Science. He eventually became director of the Lab. A great sense of humor helped as he navigated the rules and regulations. One year, for some fund, no single purchase could exceed $5,000. Dick needed to purchase some harvesting equipment, so he listed one component per order. A telephone call came from an administrative aide in Beltsville informing him of the $5,000 limit and not following guidelines. After much discussion to justify the need for the equipment and the aide's restatement of the policy, she stated she could be reached at 301-xxx-6563. Dick asked, "How did you get that phone number?" She replied, "What do you mean?" Dick said, "It is greater than 5,000." The telephone in Beltsville went bang!!!

# DR. GERALD A. JUNG

## TWENTY- FIVE YEARS EVALUATING THE NATURE OF DIFFERENT ENVIRONMENTAL FACTORS ON YIELD, SEASONAL DISTRIBUTION, AND NUTRITIONAL QUALITY OF HERBAGE AS THEY RELATE TO HERBIVORE PERFORMANCE

Soon after joining the West Virginia University Dept. of Agronomy and Genetics, I, Gerald A. Jung, was appointed West Virginia Collaborator to the US Regional Pasture Research Laboratory at University Park, PA. It was in this capacity that I first became acquainted with its staff and research program. Several Pasture Laboratory staff retired in the late 1960's, and then, new staff members, including me, were added from 1970-72. Our budgets were meager to begin with, our project showed a negative $6,000 budget. The USDA Soil, Water, and Air Division, of which I was a member, had a group of unusually talented technical advisors who were very helpful and supportive in getting our project off to a good start. Charles Gross (soil scientist) and Robert Kocher (technician) were at the Lab when I arrived and were involved in our forage program until the mid-1980's. Dr. John Shaffer (soil scientist and computer programmer, currently scientist at Penn State) joined our research group when Mr. Gross retired, and John Everhart (technician) joined the group when Mr. Kocher took a medical retirement.

Early on, Dr. Jung recognized that pasture productivity must be analyzed in the context of animal production. He teamed with Dr. R. L. Reid, an animal nutritionist at West Virginia University, to characterize dry matter intake, digestible energy, fiber, protein, and mineral element concentrations of herbage of many forage species at different physiological stages of maturity, fed as hay or pasture to cattle (170 forages) or sheep (428 forages) (1965-1990).

Forage Quality of Cool Season Grasses and Legumes. Total non-structural carbohydrate (T.N.C.) concentration in herbages of 16 field-grown cool-season grasses was found to vary from less than 10% to more than 30%. Concentration of TNC was influenced by grass species, level of N fertilizer, growth stage, and season (day/night temperature and photo period). Ryegrass herbage generally contained the highest concentrations of this readily available energy source. Concentrations were generally highest in fall and early spring and lowest in summer. This research trial resulted in a database of more that 10,000 analyses (Jung, Gross, Berg).

In the mid 1970's, Penn State faculty requested that Dr. Jung participate in a multidisciplinary Dairy Herd Health Project. For approximately 5 years, two veterinarians (Sam Guss and David Kradel) a dairy nutritionist (Richard Adams), a soil scientist (Dale Baker) and I collaborated in identifying nutritional factors causing dairy herd health problems such as downer cow syndrome (calcium deficiency), infertility problems (zinc deficiency, imbalance of calcium and phosphorus), and grass tetany (magnesium deficiency). Graduate student William Stout (deceased, an ARS Soil Scientist at Morgantown, WV, and later at University Park, PA) was employed as a technician on the Project. Graduate student (MS) David Belesky (currently ARS Scientist at Beaver, WV), developed a technique to assess soluble zinc concentrations in herbage. He determined soluble and total zinc concentrations in herbage of cool season grasses as influenced by season. A large database enabled us to survey eleven mineral element levels in PA forages with respect to dairy and beef cow nutrition for five land regions of PA. The multidisciplinary team also was first to establish normal limits for concentrations of blood components for healthy high-producing dairy cows for use in assessing blood composition of cows in "problem" herds.

Cool season grasses and legumes were grown under controlled conditions in glass houses to determine the effects of season, temperature, soil pH, and Mg fertilizer on herbage Ca and P concentrations and ratios, and temperature and Mg fertilization on Mg, Ca, and K concentrations (Gross and Jung). Richard Hill and Jung determined the genetic variability for mineral element composition of alfalfa. Information relating to concentration and ratios of mineral elements is helpful in interpreting animal health problems.

Mr. Ed Quigley (currently a dairy farmer) in MS thesis research coordinated our effort to determine responses of alfalfa and corn (silage) to sulfur fertilization on several soil types in PA. This multi-year project established current sulfur levels of these crops in the absence of applied sulfur (superphosphate) for several years. Wayne Hinish, Penn State soils extension specialist, requested this information for his use in fertilizer recommendations.

Pasture Species Evaluations. Because feeding costs in grazing systems are only 20% to 40% of those usually associated with confinement feeding, we began pasture plant evaluation to determine which plant species might be used to increase pasture production during periods when natural pastures are least productive, usually summer and fall; and which species would provide herbage with high digestible energy levels. All totaled, we collected more than 200,000 pieces of information to support grazing systems and reduce the risks associated with temperature stress in summer and/or winter, and drought.

In 1971 Dr. George Pearson (ARS plant physiologist, Morgantown, WV) and I were asked to visit the Delmarva Peninsula to examine fields of grass that were receiving spray effluent from food-processing plants. Because water was a major factor limiting growth of grass on the sandy soils, especially in summer, the applied effluent increased herbage growth substantially, and plant employees were required to mow grass continually.

We proposed that the grass be used instead for pasture, and that we would conduct a grazing trial in cooperation with the University of Delaware livestock specialist, Richard Fowler. Our cooperative investigation began in 1972 and concerned characterization of different effluents, chemical composition and digestibility of effluent-irrigated and non-irrigated (control) herbage, animal liveweight gains, and effects of grazing on infiltration rates. Chemical composition and in vitro digestibility of effluent-irrigated herbage were superior to those of non- irrigated grass, especially when crops like sweet corn were processed. Animal liveweight gain was approximately 1000 pounds per acre in 144 days. This compares with a well-established liveweight gain of approximately 300 pounds per acre in this environment without irrigation. We had both high yields of herbage with unusually high energy levels. When grazing, it would be necessary to use low wastewater application rates to avoid surface runoff and ponding in low spots.

Dr. Jung also defined environmental factors limiting grass production, particularly on marginal lands, and developed management and species selection strategies to circumvent these limits. He was first to propose and develop brassica pasture systems to extend the grazing season and did much of the pioneering work that introduced and made possible the use of Puna chicory and Matua prairie grass (both of which were developed in NZ) in U.S. pasture systems.

Extending the Grazing Season with Brassica Crops. One strategy we developed was to use spring planted forage turnip or rape to use spring rainfall to grow crops that would be used as a hedge against a summer drought. Likewise, we showed that certain forage brassica crops can be planted in spring (except turnip) or summer for grazing in Oct, Nov., and Dec. We found adapted cultivars were also very cost effective at 2-cents/pound dry matter which was 90% digestible and 15% to 30% crude protein. One

of our cooperators calculated that it cost only 7-cents/pound liveweight gain for dairy heifers grazing forage turnip and volunteer oats in fall. We received help getting started with brassica research from NZ scientists and especially Mr. Alan Pantall, a private farm consultant in NZ who visited some of our early trials and gave us lots of sound advice and encouragement.

Among the numerous findings in the brassica trials, were the exceptional cold tolerances of Forage Star forage turnip from Japan, and Premier kale bred at VA Beach, VA, some brassica cultivars were more persistent under stock piling and some tolerated multiple harvests better than others. Forage brassica information available to farmers includes data collected for 20 yrs. on many private farms throughout PA. and on farms in 13 other states from Maine to Florida, and Wisconsin to Louisiana. For information on how to grow and use crops like turnip, Swede, rape, and kale in grazing situations, it was recommended that farmers contact sources in Stockman Grass Farmer's Grazier's Resource Guide and Dr. Marvin Hall, Agronomy Dept., Penn State, University Park, PA 16802, for Agronomy Fact Sheet No. 33 and Penn State-Pasture Lab video on brassica crops for pasture.

Native Warm Season Grasses. Another strategy that can be used to reduce the risks associated with summer droughts is to incorporate native perennial warm season grasses of semi tropical origin like switchgrass and bluestem into grazing systems. We found that adapted cultivars of these grasses are very tolerant of summer temperatures above 90 degrees F and winter temperatures to at least –20 degrees F. They also were very drought tolerant and tolerated soil pH4 with aluminum concentrations that were lethal to orchardgrass. For potential use as forage crops, the Soil Conservation Service (NRCS) provided us with seed of their selections that are well adapted, highly productive in summer even at low soil fertility levels, and disease resistant. Grazing warm season grasses can be very effective in reducing feeding costs as well as providing a high level of production in summer because production costs are low and swards last 15+ years.

Stand establishment was a major factor limiting acceptance of native warm season grasses for forage. Dr. Jung helped organize NE 114 Regional Project concerning use of native warm season grasses in NE forage systems, that involved Universities in NE region and SCS (NRCS). Details of methodology and some research findings were reported in WV University Agr. and For. Exp. Sta. Bull. 699. Nutritive Quality of Warm Season Grasses in the Northeast. 1988.Michael Panciera (currently Dept. Chair, Berea College, Berea, KY) initiated several complex investigations on stand establishment of switchgrass (PhD Thesis) with the support of SCS in providing seed of switchgrass cultivars grown in several environments. Panciera's work showed seed dormancy to be a major factor limiting stand establishment. Certain cultivars had more seed dormancy than others at a given location, and location effect on seed dormancy depended on switchgrass cultivar. To break seed dormancy, Panciera showed that switchgrass had to be planted in April. Planting in late May resulted in poor stands of grass.

Lowland switchgrass produces larger tillers with lower herbage digestibility than that of upland switchgrass. Dave Timothy, grass breeder from NC State University developed new lines of lowland switchgrass with improved herbage digestibility. Dr. Timothy asked us to evaluate the growth characteristics and winter survival of 6 lines of his improved switchgrass in our environment, which we, in fact, completed over a 4-year period.

We recommend warm season grass pastures for dry dairy cows, heifers, and beef cattle. Major findings in grazing (eastern and western PA, eastern panhandle WV) and hay (grown in central PA, NY, NJ, and KY fed in WV) feeding trials for 25 years were that high rates of liveweight gain were attained, and beef cows consumed 50 % to 90% more

grass than that predicted by conventional forage testing based on fiber content. Rumen fill was substantially greater when beef cows consumed warm season grass than when they consumed cool season species. Herbage in vivo dry matter digestibility at a 40 inch height leaving a 6-inch stubble often was 70% or slightly higher in switchgrass and big bluestem hay feeding trials with cattle, but lower with sheep (1975 to 1991), and DM digestibility was underestimated by 10 to 20 percentage units using IVDMD. Dr. James Griffin (currently a scientist at LSU) conducted his doctoral research with sheep fed warm season grass hays at Penn State with guidance from Paul Wangsness. Dr. Griffin helped establish herbage DM digestibility when fed to sheep and in vivo X in vitro relationships. He also helped us conduct a pasture trial in western Pa. to determine potential of several warm season grass species when grown in combination with cool season species. The combination of warm and cool season species increased the number of days grazing and substantially shifted some production from spring to summer.

Switchgrass and big bluestem were green-chopped daily and fed to beef cattle using Calan gates and stalls and to sheep, in metabolism and rate of passage studies. Change in plant growth stage during the feeding trials was an important variable. Feeding trials were conducted at University Park, Pa. with Harold Harpster (Penn State), Stephen Abrams (Pasture Lab currently consultant at Madison, WI), and James Todd (Queen's University, Belfast, Northern Ireland). During the conduct of these feeding trials, Dr. John Grabber (currently a scientist at ARS Dairy Forage Lab, Madison, WI) collected samples from the switchgrass stand and conducted laboratory studies (PhD Thesis) of the:

1. Chemical composition of parenchyma and sclerencyma cell walls
2. Digestion kinetics of parenchyma and sclerenchyma cell walls

Similar information was collected for orchardgrass (cool season grass) except that the studies were necessarily made earlier in spring. Switchgrass is now being planted extensively in PA for pasture as a hedge against summer drought, and as habitat for pheasants. We assisted the Pheasants Forever program in western PA with switchgrass stand establishment. Extensive plantings of native warm season grass for pheasant habitat means that PA would no longer need to raise and release pheasants ($3 million per year) for hunters.

Ryegrass Evaluation. Rygrasses were evaluated as monocultures or in mixtures with alfalfa (Penn State farm and 3 PA commercial farms) or white clover in our trials. Italian ryegrass from Switzerland was more competitive to alfalfa (penetrated alfalfa canopy) in summer than were cultivars of perennial ryegrass, and all stands were productive for 5 or more years. Usually, Italian ryegrass stands are not persistent for several years.

In cattle grazing trials, Perennial ryegrass cultivars from The Netherlands proved to be more compatible with alfalfa than was a late heading cultivar of orchardgrass. Herbage digestibility averaged over 2 yrs. was approximately 77% for ryegress, 73% for alfalfa and 70% for orchardgrass. In the 3$^{rd}$ year, ryegrass paddocks contained 53% more alfalfa plants than orchardgrass paddocks. Our cooperators at Penn State (Lowell Wilson, Peter Le Van, and Richard Todd) found that well managed alfalfa-ryegrass swards persisted for 6 to 8 yrs. under rotational grazing. Generally, when rest periods exceeded 35 days, alfalfa was favored at the expense of perennial ryegrass, whereas rest periods of less than 35 days favored ryegrass. The changes in species composition were reversible within and between years.

Our ryegrass work received national recognition when ASA, CSSA, and SSSA asked Dr. Jung to senior author the Ryegrass chapter in Agronomy Monograph 34, Cool-Season

Forage Grasses (1996). Other authors for the chapter were A. J. P. Van Wijk (The Netherlands), W. F. Hunt (NZ), and C. E. Watson (Miss. State University).

Matua Prairie Grass. Perennial cool season grasses were found to vary greatly in fall herbage production on university farms in W.Va. and Pa. Smooth bromegrass, timothy, and reed canary grass were among the least productive species, whereas, tall fescue and Matua prairie grass were the most productive species. Beginning in 1986, we conducted many trials with Matua to determine its sensitivity to fall management. Winter survival was very good when herbage was removed once monthly in the fall, whereas, stands were devastated when herbage was allowed to accumulate from Sept. to late Nov. and then removed (grazed or cut) or left intact as controls. Leaving a 3-inch stubble or more improved survival compared to shorter stubble heights. Our research findings with Matua were augmented substantially when the NZ government arranged for me to interview many farmers and pasture researchers on both NZ islands concerning their experiences with this grass. They found that Matua did not persist under continuous grazing.

Tall Fescue. We evaluated four tall fescue cultivars under grazing with sheep to determine whether endophyte-free tall fescue stands would remain productive and persist over several years. Cultivars from New Zealand, The Netherlands, and the US were included in the grazing trials (Harold Harpster Penn State and Jung). We did not experience grass stand loss as was observed in the SE, USA indicating a strong environment interaction. Sheep performance was very good but varied some with tall fescue cultivar and season.

Puna Chicory. The last species we brought from NZ was Puna chicory, which we evaluated from 1988 to 1995. Because chicory was erroneously listed as a noxious weed species in Pa, it was necessary for us to obtain permission for research of the species from PA Secretary of Agriculture. We found this species to be very palatable to dairy cows and sheep. It can be grazed in the seeding year (up to 3 times in Pa.) and herbage digestibility, non-structural carbohydrate, crude protein, and mineral concentrations often were higher than those of other perennial pasture species. Animal liveweight gains often were higher when Puna was grazed than when other pasture species were grazed.

Fencing. While researching NZ forage turnip and rape on the John and Vanda Wall farm in southwestern Pa. in the mid 1970's, we learned of John's extraordinary skills in constructing high tensile steel fences. We encouraged Mr. Wall to make his NZ-learned skills available to other farmers because fencing was a major factor limiting grazing in the northeast. The Wall family then started the KIWI Fence Company, which spread their technology across PA. and subsequently the US. In 1986 we demonstrated the ease with which temporary fencing could be used to change paddock size at Penn State's Ag Progress Days. The inventor of Spider Fence came from NZ at his own expense to assist with the demonstration and talk with farmers about their fencing needs. As many of you already know, electric fencing is now used extensively on northeastern farms, a most important technological input that makes grazing economically feasible on many farms.

The Irish Connection. In 1987, Dr Adrian Conway, Director of the Johnstown Castle Research Centre in Wexford, Ireland, and I met in Washington, D.C. to help the Office of International Cooperation and Development prepare an Irish-American Exchange Agreement to provide funding for exchange visits of US and Irish scientists. We prevailed in getting pasture research included in the OICD document.

In 1988, 12 scientists from the northeast toured Ireland with Dr. Owen Carton, and Northern Ireland with Dr. Scott Laidlaw, to meet pasture experts at 10 locations and

learn how pasture quality and production, and species composition were evaluated during grazing trials. Government officials and our hosts could not have treated us better. The information we gathered during these visits had an immediate impact on our teaching and research programs. Other US and Irish scientists took advantage of the US-Ireland agreement in subsequent years.

We usually employed about 6 to 8 undergraduate Penn State students to work with us each summer. They traveled with us to private farms all over Pa. to collect data. Each year we selected one student from the previous summer to send to Belfast, Northern Ireland, for additional training that was organized by pasture authority, Dr. Scott Laidlaw. Simultaneously, we employed one agriculture student from Queen's University of Belfast each summer to work with our Penn State students. Both the Penn State and Queen's University students have given us very positive feedback concerning their experiences. Penn State and Queen's University subsequently have undertaken formal exchanges that include credit for course work. I accepted a Visiting Professorship at Queen's University of Belfast in 1986.

The NZ Connection. Two New Zealand agencies responsible for pasture investigations, DSIR and MAF, graciously extended assistance in arranging my several visits to research stations and many private farms.

In the late 1980's, we organized a cooperative research program with Grasslands Division, Dept. Sci. and Ind. Res. (DSIR), Palmerston North, NZ. Mr. M. G. Lambert, a scientist at Grasslands, developed a PhD program that involved course work at Penn State. He also conducted a brassica investigation at University Park, PA that consisted of different proportions of forage rape or grass cut fresh each day and fed to sheep in a metabolism trial. Animal performance increased as the proportion of rape increased to approximately 60% of the diet.

After two years with us, Mr. Lambert returned to NZ where he conducted his PhD thesis research (Jung and Harold Harpster Advisors). His research concerned forage production, sheep and goat preferences, forage digestibility and chemical composition of forage shrub in North Island hill country of NZ.

In the late 1980's, we suggested that Penn State employ Dr. Ray Brougham, NZ Director of Grasslands Div. of DSIR to evaluate the economic potential and sustainability of grazing on Pa. dairy farms. His report was very encouraging. He also traveled with me to neighboring states, participating in field days and encouraged farmers to try the highly successful NZ system of organizing discussion groups of 12 farmers to have pasture walks each month on one their farms. Vermont farmers were very excited about the concept and with Bill Murphy's guidance, organized discussion groups. Dairy farmers in Wisconsin also were at the forefront in this effort, with John Cockrell acting as facilitator.

In April 1993, the US Senate Agriculture Committee notified me that US Senators from northeastern states were concerned about the future of pasture research at the Lab after my retirement. Eight US Senators from the NE region sent a letter to the US Secretary of Agriculture explaining why the Federal Government should play a primary role in the conduct and delivery of pasture research. They commended the work done at the Regional Pasture Research Laboratory and asked that the program be continued and augmented as well. Farmers are being asked to participate in the selection of research program's objectives and research plan's implementation. The Senate Agriculture Committee also provided me a signed copy of their letter, which I framed and now hangs in my office.

The Co-Chairman of the US Ireland Joint Committee and the Irish Liaison Secretary, Head Office of the Agriculture and Food Development Authority, Dublin, Ireland, sent a letter on 24 November 1994, acknowledging and thanking me for contributions to the success of the Irish American Exchange Program underway since 1988.

For 17 years, we received National Science Foundation grants to research the chemistry of plant cold tolerance. I obtained a Certificate in Cryobiology for course work at Washington University, St. Louis, Mo. For ten years, our team [Jung, Shih (deceased), Shelton (retired)] researched the effect of applying nucleic acid components (purines and pyrimidines) to plant leaves in early September to determine their influences on metabolic alterations that occur in plants during cold hardening in fall, and dehardening in late winter. Foliar applications of cytosine or guanine were particularly effective in increasing plant cold tolerance of a non hardy cultivar, and kept these plants semi dormant in late winter when unsprayed controls broke dormancy and were susceptible to frosts. Unsprayed contols had only 5% survival rate, whereas, certain foliar spray treatments had 70% survival. During the final 7 years, I moved the grant to Penn State and organized a new team [Jung, Krasnuk (retired), Witham (deceased)] to conduct electrophoretic studies of enzyme activity, solubility, and resistance to temperature denaturation, during development of plant cold tolerance.

Activities Other Than Research. "Dr. G.W. Burton and Dr. Jung represented the USA on the Presidium of the XII International Grassland Congress, Moscow, USSR 1974." Dr. Reid asked Dr. Jung to assist with the organization and funding for the International Hill Lands Symposium which was to be held in Morgantown, WV in 1976. The Meeting culminated in a tour through Ohio, Pennsylvania, and New York. Later, a 770-page book of the Proceedings was published.

Dr. Jung was one of three scientists who conceived, proposed, and received Rockefeller Foundation funding for the Allegheny Highlands Project. The Project tested a new multidisciplinary (agronomy, animal and veterinarian sciences, economics) Extension approach to disseminate technology to WV farmers in a mountainous area (1970-1980).

In the late 1980's, a farmers' cooperative in Colombia, South America, invited me to bring Dr. Reid and trouble- shoot for their farmers who were experiencing pasture and dairy herd health problems. In addition, they requested we participate in a two-day symposium to acquaint farm consultants and veterinarians with solutions to some production and nutritional problems. Apparently we were appreciated because the US Embassy asked that we delay our return to the US so we would be available to travel to visit other farms, which we did.

It is with profound gratitude that I acknowledge the enormous contributions by technicians, numerous students at Penn State University, WV University, and administrative support staff, who provided dedicated help during the conduct of our research. Without their help we could not have achieved our research goals. To the many farmers who graciously let us use their land/animals we hope the research findings will justify our intrusions on your farms.

Since leaving ARS in January 1995, I have received several awards:

- NRCS-ARS-NACD Award for pioneer work with native warm season grasses worthy of use by eastern farmers (1999)
- The American Forage and Grassland Council Distinguished Grasslander Award for 2000
- The South Carolina Cattlemen's Association, Industry Service Award (2001)
- In 2003, I was given Adjunct Professorship at Clemson Univerity

## William A. Kendall written by Peggy Kendall

Bill was born 9/24/1924 in Fitchburg MA a small city in Central Massachusetts. His father drove a truck for a wholesale grocery chain all over northern New England. He worked as a paper boy in his early years and then in the summer as a farmhand for a rich man's hobby earning $1.00 a day chopping weeds and making hay. A night job in '41 and '42 was as a helper in the bingo parlor sponsored by the B&M Railroad. In June of 1943 he was a lineman on the B&M Railroad.

He enjoyed skiing in Tuckerman's Ravine on Mt. Washington in N.H., ice hockey and bicycling. One trip on a one speed bike was from Fitchburg to Mt. Chocorua, NH and return, 250 miles. Another on a 3 speed bike was from Fitchburg to Orono, Maine to N. Conway, N.H. to Fitchburg, 600 miles.

September '42 he enrolled in the University of Maine at Orono. December of '42 he enlisted in the USMCR. July of '43 he began active duty with the Marines. He began his training in the V-12 Program at Cornell, going to boot camp in San Diego, Infantry Training at Camp Pendleton and more training on the Hawaiian Islands. On February 1945 he landed with the first wave of troops on Iwo Jima where he was a Machine Gun Squad Leader. On March 8 he was wounded and spent 14 months and 9 days in the hospital finally being discharged as a Sergeant May 16, 1946.

He returned to the University of Maine majoring in Agronomy and getting his BS in 1949. The summers of 1947 and 48 he monitored the Potato Aphid populations for the Maine Agriculture Exp't Sta.
In 1949 he went to the Ohio State University to study Plant Physiology. While working on his MS and PhD he evaluated plant herbicides and defoliants. I went to OSU to get an MS in Horticulture in 1951 and that is where we met.

His research for his MS was "Measuring the Effect of Intermittently Varied Petiole Temperatures On Carbohydrate Translocation in Bean Leaves." For his PhD he researched "The Effect of Metabolic Inhibitors On The Translocation of P32 in Bean Plants." During the latter research as his fiancée and later wife I was privileged to work with him on a volunteer basis and discover what a kind and patient man he was.

His first position after receiving his PhD in June of 1954 was a joint appointment between the U.S.D.A. and the University of Kentucky in Lexington where we stayed until 1970. His research was mainly with red clover working with colleagues to determine why red clover a perennial would survive for only two or three years. He also developed a procedure to self pollinate genetically self incompatible red clover plants. He developed a method to generate foam with legume forages. This method led to identification of some plant constituents which influence bloat in cattle and was used in two other research stations

In 1970 the one man USDA position at Kentucky was to be terminated. The position was opened at the Pasture Lab and Bill asked for a transfer and got it. While at the Pasture Lab he developed a technique known as slant boards to provide access to plant roots which facilitated the monitoring of root growth as affected by environmental pathological and insect

treatments. The plants were grown in growth chambers. The method was used at several research stations.

He developed a feeding procedure with meadow voles to evaluate the palatability of forages. The method was also useful in identifying forage constituents that influenced palatability. The biggest disappointment of his career was when his research with the meadow voles was closed down in favor of working with the blue duiker a small African antelope. The Animal Science Department was never able to develop a colony of these timid little animals.

From the time of his retirement in 1989 until his death on New Year's Eve 2001 he kept up his interest in plants by helping daughter Linda and son-in-law Peter identify the many grasses, legumes and weeds on their 20 acre lot in Manchester, Michigan, He also built a bench with lights so we could raise a few orchids in the basement. His children kept him busy repairing or restoring furniture some antique and some not. He continued to make keeping our lawn in good shape a major project.

Bill thoroughly enjoyed his time at the Pasture Lab. He was able to plan and do his research with a minimum amount of supervision. He enjoyed working with his colleagues, Ken Leath, Jerry Jung, Dave Gustine, Clyde Berg, Bob Sherwood, Dick Hill and Barb Pennypacker and fully appreciated the work and commitment of his technician Stephen LaMar. It was a particular joy when Bill and Martha Templeton, friends from our Kentucky days, moved to State College when Bill became head of the Pasture Lab. The times we all had together at lab parties, picnics and coffees are special memories.

## Ken Leath

I came to the laboratory in 1966, having just finished my graduate studies and in need of a job. Joe Sullivan, a chemist, was the Director; Dick Hill, Ken Zeiders and I were the alfalfa team; Clyde Berg was the grass breeder, and Dick Newton was the entomologist. There was also a soils group consisting of Bob Robinson and Charlie Gross. Vance Sprague was the physiologist, and Helen Hill worked on a cytological project. The technicians group consisted of Harold Donley, Paul Kellerman and Bob Hess, while Lois Smith, Amina Berkemeir and Dawn Neidigh handled all the office duties. In 1972, many changes occurred and are summed up in Bob Barnes's contribution. Breeding for disease and insect resistance in alfalfa, red clover and orchard grass was a main objective. In 1968, I filled in as interim Lab Director and oversaw the completion of the building addition, which was enthusiastically welcomed by everyone at the lab.

Over the years many collaborative relationships evolved, however my main research cohorts were Dick Hill, Bob Byers, Bill Kendall and Barbara Pennypacker. Felix Lukezic and Art Hower at Penn State were also valued contributors to my project. I was fortunate also to have fine support help from Bill Priddy and Ruth Halderman. Back in the 60's and 70's most of the researchers went to regional project meetings in New York City. We took the train from Lewistown each Jan. 2nd and met in downtown, and for the most part down – trodden, hotels. I was never sure why we met at that time.

Many amusing memories of Pasture Lab happenings come to mind. For example, I remember the PL pets: a meadow vole, a tarantula and, for a brief time, a rabbit in the headhouse. Other things that might bring a smile to those in the know were; a scientist with his finger caught in the grass clipper; a ground hog going up the chute of the forage harvester; a Director with his tie immersed in his coffee cup (it looked like a chromatography study); a drawer labeled, "string too short to save"; a shop completely filled with wood smoke from the circular saw, a basement contaminated with Pseudomonas; a huge pair of navy-surplus binoculars that ended up in the trunk of the branch chief's car, a Jeep gas tank that fell out onto the parking lot; an air replacement system that collected all the flies in the attic and deposited them in front of Jerry Jung's office door; a geranium collection in the greenhouse; and the aroma of orange liqueur wafting through the halls around Christmas time. I also remember our first computer, the Mathatron, that cost around $15,000 plus $10,000 for a software package and $500 service visits every 2-3 months to keep it running. And we were all in awe of it.

On a more serious note, I would be remiss if I failed to mention two extremely friendly and helpful individuals who are no longer with us, mainly the technicians, Bob Kocher and Bill Campbell. What a fine pair of gentleman they were.

My apologies to anyone who helped me along the way and whom I have failed to mention here. I greatly valued my years at the Pasture Lab, the graduate students, the post docs, the foreign visitors and the many bright colleagues who shared those years with me.

# RICHARD CARL NEWTON

Richard Carl Newton of Cherryfield, ME celebrated his 100 birthday August 19th 2004, at the Narraguagus Bay HCF in Milbridge. Born in Middletown, CT he came to Cherryfield as a college summer student in 1927, 28 and 29 studying behavior of blueberry pests under the direction of the U. S. Department of Agriculture, Agriculture Research Service (USDA,ARS) Laboratory located in Cherryfield. Research conducted resulted in better methods of insect control and increased blueberry yields. While in Cherryfield he met Marion Campbell whom he later married.

Various research positions with USDA,ARS located Richard and Marion in Salt Lake City, UT (1931); Medford, OR (1932-37) where their only child, Mary Ann, was born; Grand Junction, CO (1937-38); Bozeman, MT (1938-57) Entomology Research Laboratory at Montana State University; and State College, PA (1957-69) Pasture Research Laboratory until his retirement in 1969 after 40 years of federal service. His research at Bozeman, MT on the identification, life cycle and biological behavior of several species of grasshoppers was beneficial in controlling huge out breaks of grasshoppers that devastated crops in the Western United States. Research at State College, PA was tremendously important to the understanding of insects that invade and destroy legumes such as alfalfa in the New England States. His research is documented in many scientific publications and the hundreds of insects he collected and mounted throughout his research career were donated to his alma mater, the University of Connecticut, Storrs, CT. He received his Master of Science degree from the University of Massachusetts, Amherst.

After retirement, Richard and Marion returned to Cherryfield to settle in Marion's ancestral home on Campbell Hill. The home always was noted for the beautiful red geraniums in the bay window, plus a cat. Widowed in 1989, Richard lived alone until recent health problems necessitated his move to the HCF. Although hard of hearing, he enjoys visits from his many friends and reading the Bangor Daily News. One of his regular visitors is his former cat, George, and the lady from Bangor who adopted George because Richard had to give him up when he moved into the HCF. His many interests through the years including arrowhead collections, photography and painting have kept him young at heart.

Richard's daughter and son-in-law, Dr. Clifford A. Watson, who reside in Warrensburg, MO were present for the celebration. His two granddaughters and 5 great grandchildren were unable to attend. In addition to the nearly 100 friends that attended the celebration, birthday greetings were received and recognized from President George W. and Laura Bush; Governor John Baldacci; Dr. Edwin Knipling, Administrator, USDA, ARS; The Entomology Department, Montana State University; USDA, ARS Pasture Research Laboratory, University Park, PA; and many friends who reside out of town.

Many years ago the Boston Globe presented Cherryfield with a "Golden Cane" to be entrusted with the oldest resident of Cherryfield. The cane was entrusted to Richard in 1996 and he says he intends to take care of it a few more years. Good going Richard and may GOD BLESS YOU.

## William C. Templeton, Jr PhD

In 1976 or 1977 Dr. Robert Barnes called me at the University of Kentucky, where I was Professor of Agronomy, and asked why I had not applied for the Lab Director position. I responded that I didn't know the position was open and as I was happy at UK, I didn't read position-open advertisements.

Shortly after that, Dr. Jack B. Wilson, Area Director, called and asked about an interview. I agreed and when we met he outlined the nature of the Director's responsibilities, et cetera. My wife, Martha, and I discussed the offer and later accepted.

It began innocently enough. Martha and I went to State College to see about housing. A realtor had been suggested by friends there and he drove us by some that were for sale. One was recommended above the others but we didn't see it. As Martha suggested, I returned later alone saw the house and after talking price sufficiently I bought it. When she and I returned (with the moving van on the way) I couldn't find the house! She said, "This is something else. You bought the house without my seeing it and now you can't find it? Finally, we did and enjoyed our stay of six years so very much.

Sadly, one staff member died while we were there and another (internationally known for his research) died shortly after our departure.

In my judgment, the highlight of the Lab's accomplishments during our time there was the following:
Karl Norris, ARS, and associates had developed a procedure using near- infrared reflectance spectroscopy (NIRS) for determining the chemical composition of wheat in approximately one minute after samples were prepared. After discussion with the Section leaders we decided to prepare a project proposal and send it to ARS. Basically, it was to test the hypothesis that the Norris Procedure for determining wheat chemical composition could be used, perhaps with minor changes, for determining the composition of forages, the proposal included research at the Norris lab, at USRPRL and four other locations having facilities, expertise and administrative approval either present or able to be obtained.

To my surprise and delight, our proposals for this and other equipment needs were approved in full and in record time. Large numbers of samples were prepared at USRPRL i.e, ground to very small particles, divided with special equipment to ensure uniform composition of samples for analysis. The samples were identified by material and a number. After analysis the results were returned to USRPRL where statistical tests determined agreement of the various laboratories.

Results: Differences between laboratories were satisfactorily small and analyses agreed well with wet-chemistry analysis.
Conclusions: The NIRS method was highly satisfactory for analysis of forages, far less expensive and much more quickly performed. Computer programs were later developed for ration balancing so that farmers can have their alfalfa hay other forages analyzed to determine supplements required to provide adequate rations for the level of production desired.

As a result of the efforts of many individuals, this method is now widely used, not only in the United States but in many other countries, and has also found application in the analysis of various food products for humans as well.

Appreciation is expressed to the Pennsylvania State University for the advice and service of several specialists.

We often fondly remember the many friends we made there, as well as the wild Lady Slipper orchids that flourished in the woods behind our house.