THE UNIVERSITY OF IOWA SPRING 2021

Department of Earth and Environmental Sciences Newsletter

Message from DEO David Peate

As I write this letter on a sunny but chilly April day in Iowa City, looking out of the window at the appearance of new Spring plants outside, I feel a sense of optimism that the worst of the pandemic is behind us. Many faculty, staff and students have started or completed their COVID-vaccinations, and we are planning to run the Montana field courses and the National Parks trip to New Mexico at the end of next month. University expectations are for the Fall 2021 semester to be largely 'back to normal', with 'in-person' teaching and just some of the largest lectures online. This gives us confidence to hold the delayed inaugural Triennial Alumni Homecoming Event in October (see details elsewhere in the newsletter from Amy Sullivan, chair of the EESB – Earth & Environmental Sciences Department Alumni Advisory Board).

Our department secretary, Chris Harms, retired at the end of 2020 after over 19 years of service to the department, and has moved to Colorado. For as long as I have been in Iowa, Chris has been the friendly face in the main office, giving selflessly of her time and kindness to support students, staff, and the department.

We will all miss her. On behalf of the whole department, I want to wish Chris all the best for her new life in Colorado. It is also a pleasure to welcome Alexandra (Ali) Geraets – the new front office person in Trowbridge Hall. Ali recently got an M.A. in Higher Education and Student Affairs from the University of Iowa College of Education, and she will also be taking on the role of Undergraduate Academic Coordinator for the department.

In this newsletter, we highlight the legacy of Max Littlefield and family. The Max and Lorraine Littlefield Fund is one of the largest endowments for the *(continued on page 3)*

Earth & Envrionmental Sciences Alumni Board News Briefs

by Amy Sullivan, EESB Chair

Zoom photo from Spring 2021 EESDAB Board Meeting

New EES Faculty Liaison to Alumni Board

Kate Tierney-Cramer is the board's new Faculty Liaison. Kate joined the department in 2015, is a lecturer and has taught Geology of U.S. National Parks, Sedimentary Geology and Climate Change Seminar. She organizes many field trips including the Spring Field Trip course. She is also the Environmental Science Club Co-President. Kate organized the fabulous 2019 Distinguished Alumni celebration on Homecoming. Kate research covers lithostratigraphy and chemostratigraphy of Permian limestones. The EESB thanks Kate in advance for supporting the board.

Our previous Faculty Liaison was Brad Cramer, who in 2018 helped build out the board and draft new bylaws with Tom Foster. He always ensured the board was welcomed around the department with informal chats, field trips and inclusion in poster sessions and departmental events. Brad has hosted numerous GSA and AAPG receptions. As Chair I appreciated the open and transparent communication we shared to assist the board's understanding how best to support the department. Congrats on Brad's new position as the Provost's Faculty Fellow for Diversity, Equity and Inclusion. Thank you Brad for your support!

Triennial "All Alumni Day Celebration"!! October 15-16, 2021

Come to Iowa City for Homecoming! If you live in Iowa City please volunteer. Every three years the Alumni Board hosts special alumni events. Contact Amy Sullivan, Chair (cajes@mindspring.com).

PLANNED TRIENNIAL ALL ALUMNI EVENTS

Thursday, Oct. 14	Distinguished Alumni Award (DAA) Winners Arrival Joanna Thamke 2020, Ron Blakey 2021
Thur.-Fri., Oct. 14-15	Student lunch with Joanna Thamke and Ron Blakey
Friday, Oct. 15	EES Alumni Board Meeting (All are invited to attend) - Trowbridge Hall
Friday, Oct. 15, 1:30 – 3:30	Student Poster Session- Trowbridge Hall

Friday, Oct. 15, 2:30 – 4:30	DAA Awards and Lectures - Trowbridge Hall
Friday, Oct. 15, 5:30 – 7:00	DAA Reception - Downtown Venue TBD
	Homecoming Parade
Saturday, Oct. 16	Field Trip - details to follow
Saturday, Oct. 16	Iowa v.s. Purdue - Kinnick Stadium

Other Potential Activities and Events:

- Slide Show plus other virtual events
- Iowa Geode Star Gallery
- Alumni Coffee and Bagels
- Meet and Greet with Students
- Meet with AAPG Student Chapter
- Meet with ENVS Student Clubt
- Tour Iowa Hall – Museum of Natural History
- Repository Tour
- Emeritus Professor Meet and Greet
- Spouse Events
- Self-Guided Coralville Reservoir Trip or Picnic

Nominations / Self-Nominations for New Board Members Going On Now!

Consider a position on the Alumni Board! You may nominate yourself or others. The Nominating Committee is seeking as many as 6 new voting members starting in October 2021. Terms are 3-years with the opportunity to serve a second 3-year term. Re-establishing personal connections with the faculty and staff, supporting students and having a blast at Homecoming are the perks.

"I self-nominated to join the EES Alumni Board because I wanted to reconnect to the department and help students understand how their academic and industrial career paths may evolve." -Noah Stern - Agricultural Research & Development Lead at AmebaGone, Madison, WI; 2005 UI B.S. Environmental Science, M.S. Applied Environmental Geology at Eberhard Karls University in Germany, Ph.D. Environmental Chemistry and Technology at University of Wisconsin

Want more info? Contact Amy Sullivan, Chair (cajes@mindspring.com) or any board members to find out more.

NEW!! Department History Web Page

Preliminary research indicates the department was founded in 1874 when Samuel Calvin became the UI Professor of Natural Science which means the 150th anniversary of the department will be in 2024! Take a look at the EES historical timeline and the "Family Tree" of collaborative historical partnerships which have advanced Iowa Earth Sciences. https://clas.uiowa.edu/ees/about/department-history

Message from DEO (continued)

department, and we are very grateful to the Littlefield family and friends for establishing this fund in memory of Max and Lorraine. This generosity has impacted the lives of so many of our graduate students by facilitating their research activities, especially field work, and thus setting them on the path to have successful careers in academia and industry.

I am grateful to all alumni and friends for your continued support for the Department of Earth & Environmental Sciences. I would like to encourage you all to come to Iowa City in the Fall for the triennial Alumni Homecoming Event (Oct 16th 2021) so that you can see for yourselves all of the exciting new things happening in the department, and reconnect with old friends.

Ali Geraets, EES Academic & Office Coordinator

Max Littlefield

by Amy Sullivan, EESB Chair

This issue is dedicated to the legacy of Max Littlefield. We graciously thank his son Larry Littlefield for providing the biographical materials presented here. The Littlefield family, as a whole, are enormously important to maintaining the long term viability of the Earth and Environmental Science Department. A memorial Geology Fund was set up in memory of Max when he passed in 1967. Many have contributed to the fund over the years. The Max and Lorraine Littlefield Fund, was renamed in 1992 after Lorraine passed. Lorraine and Max were very happy in Iowa City and Lorraine was instrumental in Max's education and career. Max and Lorraine enjoyed gardening, tennis, and bowling.

The Littlefield Fund is one of the largest endowments for the department. The Littlefield Fund's purpose is to encourage field studies at the M.S. and Ph. D. levels. How many EES Alumni and current students have been to Baraboo Region of Wisconsin? Max was there in 1922 with Charles Wentworth (Wentworth Particle Scale). Max also directly worked with Dr. Arthur Trowbridge at that time. He had great experience in the Devonian, Mississippian, Pennsylvanian, and by the 1940's was a carbonate specialist. He met emeritus professor William Furnish in Venezuela in 1947. So you can see his Iowa roots and connections kept coming back to the department.

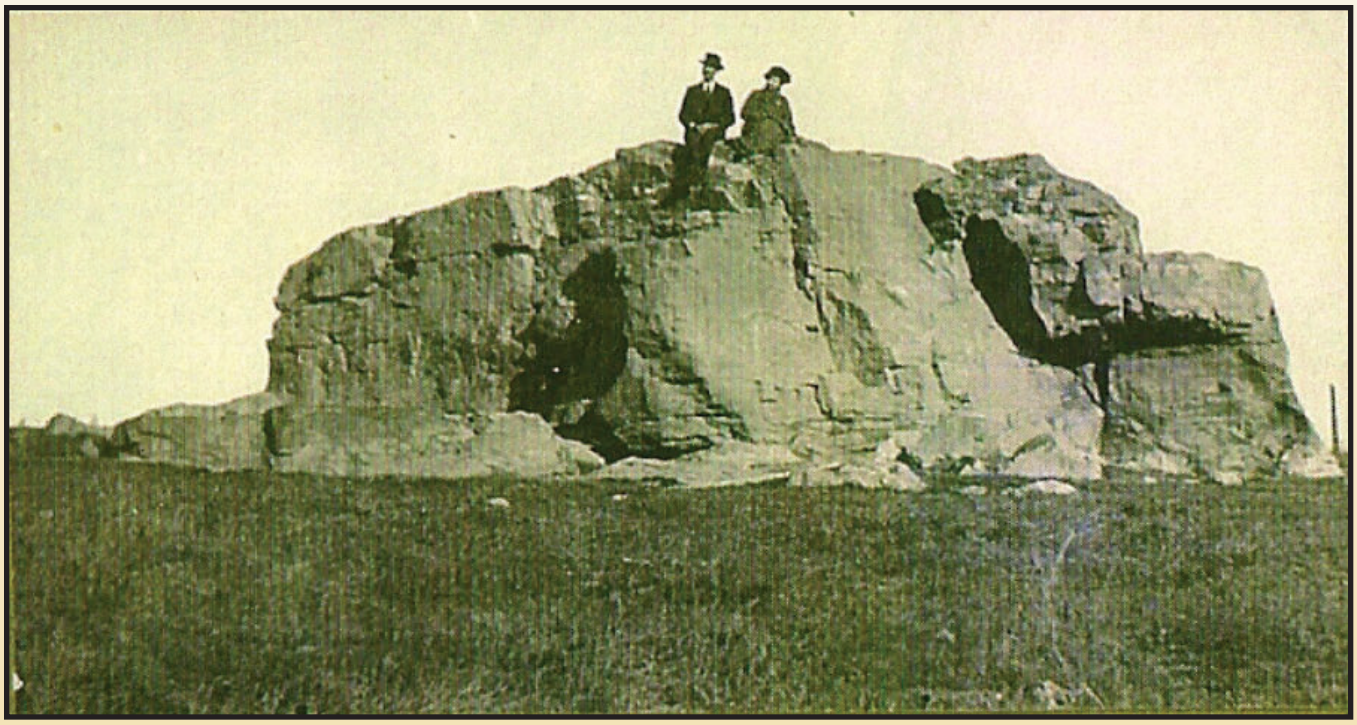
Max Sylvan Littlefield (July 1, 1900 – December 24, 1967) was born outside Cherokee, Iowa and grew up on the family farm where he was exposed to artifacts, gravel pits and glacial erratics. His interest in archeology lead him to the natural sciences. He enrolled at UI and received a B.A. in Chemistry in 1921. He received his Ph.D. from Iowa in 1925. In 1927 Max began his career in the petroleum industry with Gypsy Oil Company, a subsidiary of Gulf Oil Corporation. Over the years Max investigated the subsurface in Illinois, Oklahoma, South Dakota, Indiana, the Rocky Mountains (Montana, Alberta, Saskatchewan), Powder River Basin in Wyoming, Montana; Maracaibo, Venezuela; Florida, Cuba, Denmark, Sicily, British Honduras, Spain, and Libya. His career took him to Gulf's International Division headquarters in New York in 1958, and Max and Lorraine made their home in Westfield, New Jersey.

Max in the field in 1922

Larry Littlefield noted, Max said "studies of well sections and the resulting stratigraphic prediction is the most interesting hobby known to me". Well said Max! We won't forget your contributions.

Max Sylvan Littlefield, son of Fred Everett and Mary Grace (Stedman) Littlefield, was born July 1, 1900, on the Fred Littlefield Farm (also known as Oakwood Farm), located about two miles north of the town of Cherokee Iowa. His grandfather, Ammiel David Littlefield had been a highly skilled marble and stone-cutter in Milford, Massachusetts. Throughout the Civil War he served in Co F, 36th Regiment, Massachusetts Volunteers. In 1879, when his son Fred was four years old, Ammiel brought his family by train to Cherokee, in the Little Sioux River Valley of Northwest Iowa. Ammiel's sister and family had been pioneer settlers of Cherokee. In 1857 these settlers pacified hostile, marauding Indians with food. Some of the warriors then continued north and were part of the infamous Spirit Lake Massacre.

Max spent his boyhood on this Cherokee farm. He helped plow the soil, plant, harvest, and tend the animals. He fished, canoed, ice skated and swam in Mill Creek, that ran through their farm, and in the Little Sioux River, which ran through nearby Cherokee. He heard fascinating stories about this land, picked up interesting rocks, fossils, arrowheads, potsherds and stone hammers – curious things that had their own stories to tell. There was a gravel pit on the farm where he went to explore for unusual rocks and Indian artifacts. Pilot Rock, the largest glacial erratic boulder of Sioux Quartzite in the State of Iowa, was only three miles away. Young Max was fascinated by Pilot Rock. There are not many places in Iowa that have an immense rock sitting at the surface.



Pilot Rock, with Fred and Mary Grace Littlefield, Max's parents, sitting on top. Summer 1919

The farm's draft team was a pair of ex-circus horses and his sister Ione, ten years younger than Max, wrote: "He was almost professional, riding atop a pair of horses. I've seen Mom about flip, watching him from the kitchen window, as he galloped up the road west of the house, standing on the backs of the team – one foot on each horse".

Young Max collected Cracker Jack baseball cards, postcards from all over, souvenir pins from fairs and elections, and postage stamps. Max graduated from Cherokee High School, June 1, 1916, a month before his 16th birthday.

He began studies in 1917 at Buena Vista College, in Storm Lake, Iowa. He seemed to be most interested in chemistry and wrote in his journal that he "worked in chem lab all day. Cummins helped me set up the H2S machine. He told me I ought to take organic chem. I am going to take it but it will mean no football". He also boxed and often mentioned going out on the lake in a canoe. When he turned 18, he joined the Student Army Training Corps and after a while was appointed corporal. Although he came down with the flu during the 1918 pandemic, he was only hospitalized for a few days. On November 12, 1918, one day after the end of WW1, he wrote: "I hope we continue in service as I wouldn't know what to do out of it. There are rumors that we will be mustered out. I hope not." He was discharged on Dec 13, 1918 by reason of Expiration of term of service.

Some time during his teen-age years, Max thought about archeology as a career. He told his son, Larry, that he once hopped a freight train to Chicago and went to the Field Museum to talk to an authority there about archeology. The man asked Max if he was from a wealthy family willing to provide funding for archeological expeditions. It was the way such things were done back then. That pretty much settled that idea.

Max heading for Iowa City on foot August 8, 1919

Max started for Iowa City on August 8, 1919, walking and hitchhiking, and arrived there in a day and a half. He enrolled in the State University of Iowa. Max worked his way through college doing odd jobs: He washed dishes, waited tables, made sandwiches and cooked in a restaurant. He worked for a while in a cannery and sold encyclopedias one summer. In 1921 he received a B.A. in Chemistry. He then changed his major to geology.

During June and July of 1922 Max took a geology field course – Chester Wentworth in charge – in which he was required to write a report on The Geology of the Baraboo Region in Wisconsin. Chester was somewhat of a mentor for Max at Iowa. Chester commented: "Your report is a very creditable piece of work, surpassing in maturity of understanding and in general directness and accuracy of treatment any other report I have received. A few omissions, such as lack of detailed page references and of dip and strike symbols on maps were noticed. Detailed comment on certain grammatical and rhetorical errors have been given above. Your work in the field was, on the whole, the best of the party and I am reporting to the Registrar the grade of A for the six semester hours of the combined field work and Report."

In June, while in Wisconsin, Max wrote a note to Dr. A. C. Trowbridge, asking if he could borrow an alidade (a surveying instrument). He received a reply from Dr. Trowbridge that "I would be perfectly willing to lend you the alidade all right, but have a job for you down here and hope you will change your plans and take it". Dr. Trowbridge was employed by the Army Corps of Engineers to do a study of the sediments at the mouth of the Mississippi River.

Dr. Trowbridge wrote:

"In the summer of 1922, Max was my assistant at the mouth of the Mississippi River and both (of us) employed by the U.S. Army Engineers. For the most part I collected the samples and Max analyzed them in a lab set up by him on an Army houseboat. He studied many hundreds of samples for which he received credit in my paper "Building of Mississippi Delta". I was chairman of his examining committee for both M.S. (1923) and Ph.D degrees (1925). His M.S. thesis was on 'Bay Muds at the Mouth of Mississippi River'. Being an independent and original worker, he required little help. In his time here (Iowa City), sedimentology and especially laboratory analysis of sediments was in its beginnings."

Max Littlefield and Chester Wentworth December, 1922

E. O. M. No. 237
43,915—V-P. P. 50M—1-23-20.

ADDRESS REPLY TO
THE DISTRICT ENGINEER
329 CUSTOMHOUSE
NEW ORLEANS, LA.

REFER TO FILE No.....

WAR DEPARTMENT
UNITED STATES ENGINEER OFFICE
NEW ORLEANS, LA.

July 13, 1922.

Mr. Max Littlefield,
Iowa City, Iowa.

Dear Littlefield:

Your letter of June 30 reached me last night. I would be perfectly willing to lend you the alidade all right, but have a job for you down here and hope you will change your plans and take it.

Col. E. J. Dent has just this morning authorized me, at my request, to invite you to report at this office in New Orleans on July 25 and to serve as my assistant from that date to the end of my season on September 1 or 15. This office will pay you at the rate of $90.00 per month and will pay your expenses on a travel basis from the time you report here until you leave at the end of your period of service. As you are outside this district, railroad fare and subsistence cannot be paid to and from New Orleans, but with the pay while here, you should be able to make the trip without expense to yourself and perhaps to make a few dollars extra. I consider it a fine opportunity for you, and hope you can accept. Please wire me at this address upon receipt of this letter.

Beginning July 25, I shall have the use of a houseboat on which we will live, from which we will work by launch, and on which I shall rig up a rough laboratory for analyzing sediments collected. You will help me with the cooking, etc., and with the field work, but probably most of your time will be taken up with the laboratory work on the houseboat.

This summer job will carry with it, if I can make the necessary arrangements, my research assistantship at Iowa during the next academic year. This will pay $70.00 a month for the 10 months of the year. The work will be chiefly with the sediments collected here this summer. You should be able to make a thesis out of it without difficulty. What about this? You need not answer, however, until you report here.

Cordially,
A. C. Trowbridge Geologist.

Letter from A.C. Trowbridge, from New Orleans, to Max Littlefield, Iowa City

In March of 1923, Max sent a collection of twenty-two geological specimens to add to the geology collection of Cherokee High School. Each of the specimens was accompanied by a description and the locality where it was found. Many of the specimens were found in Cherokee County.

While at the university, Max became a good friend, and roommate, of another geology student, Walter V. Searight, from Odebolt, a town only about 35 miles southeast of Cherokee. I think Max met Lorraine Searight, Walter's sister, on a stop-over in Odebolt on a trip back to Cherokee. Lorraine was an accomplished pianist and had studied music for a time at Grinnell College. She transferred to Iowa in 1922. On September 20, 1923 Max and Lorraine were married in Odebolt. Lorraine then dropped out of school and went to work for the Child Welfare Research Station at the University, until Max finished school. She also typed his reports then, and for many years thereafter. Max worked for the Illinois Geological Survey in the summers of 1923 and 1924. The State of Illinois had a large number of foundries, and Illinois was the third largest producer of molding sands in the country. Max was commissioned to make a thorough study which resulted in a report entitled Natural-Bonded Molding Sand Resources of Illinois. Back at the University of Iowa, Max worked on Research Assistantships and part-time teaching. His molding sand study in Illinois was accepted by the University for his Dissertation and he received his PhD from Iowa in 1925. He continued his work in the geology department after graduation.

In the summer of 1926 he built a little "houseboat" and went alone from Batesville Arkansas, down the White River to the Mississippi, and then on to New Orleans. I suppose the trip was just for the river experience.

In the early part of 1927 Max left the University and went to work for the Empire Oil Company, in Bartlesville, Oklahoma. Lorraine stayed in Iowa City until the close of the school year and then joined Max. Their daughter, Mary Jo. was born in Bartlesville on October 31, 1927.

On November 15, 1927 Max was hired by W.B. "Shorty" Wilson, the chief geologist of the Gypsy Oil Company, to work for that company in Tulsa, Oklahoma. The Gypsy company was the Oklahoma subsidiary of the Gulf Oil Corporation. From that time until the mid-1950s, Max's home base was the Gypsy Laboratory in Tulsa, working on physical properties of rocks as applied to oil prospecting, drilling and production. Over the years his range of experience steadily increased from Oklahoma and its surroundings to the northeast Mid-continent, to the Rocky Mountains, then to Canada and eventually to overseas areas, while still returning, occasionally, to his laboratory base in Tulsa.

AIDS COLLECTION FOR HIGH SCHOOL

MAX LITTLEFIELD PROCURES AND CLASSIFIES TWENTY VALUABLE SPECIMENS

CHEROKEE'S PAST

Geology Presents Proofs of Time When This Region Was Under Seas and Glaciers.

Max Littlefield of Cherokee, research assistant of the Geology department of the State University of Iowa, has materially added to the geology collection of the Cherokee High School. He has sent twenty-two different varieties of geological specimens with two and three different specimens of some of the varieties. The specimens were accompanied by an interesting write-up concerning each specimen and the localities where they were found. This collection is especially interesting as several o the specimens came from Cherokee county. Among these are an especially fine specifen of Cornelian Agate, a piece of silicified wood which was found in Mill Creek and was probably carried there by the Kansan glaciers; orthoclase variety of feldspar which was broken from a boulder on Mill Creek, and a specimen of vesicular basalt showing an agate in place. There are also included in the collection several fine fossil specimens, especially of some of the corals that once flourished in the Devonian sea which covered the greater part of Iowa, and of several of the Brachiopods that also once lived in Iowa.

A most interesting letter accompanied the specimens and several very helpful suggestions were offered as to the location of certain specimens in Cherokee county and also on the use of such an exhibit. Mr. Littlefield is to be highly commended for retaining so great an interest in the high school of his home town and for spending so much time in the preparation of this fine collection. He explained that his attention had been called to Mr. Bell's departure by an article in The Times.

Clipping from the Cherokee, Iowa Newspaper (March 9, 1923)

Max's little "houseboat"

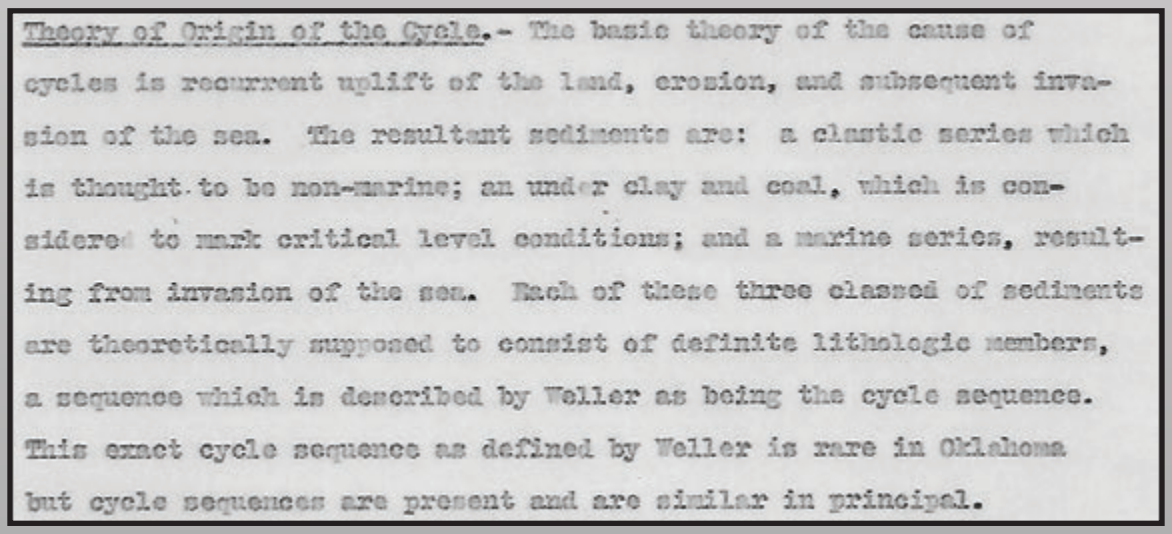
Back L-R: ?, Furcron, Grove, Harrell, M. Kay, R. King, Apfel, Cox, Foster, Thomas, Sidwell, Grawe, Trowbridge, Lambert, Littlefield, Lugn. Front: Fenn, Cornwall, Leatsler, Mortimore, Searight, Runner, Kay, Ladd, Wentworth, Petty

We have few details about the period from 1927 to 1931 as most of the work would have been relatively close to home, so there were few written communications with his family. This would certainly have been a time when he was doing field geology studies, familiarizing himself with the rocks outcropping in Oklahoma and surroundings. He also did well-site geology on wells drilled by the company. Although Max must have written numerous geological reports for the company, the earliest of these which we found was done in 1931.

During the winter of 1930-1931 Max did a detailed study of drill-cuttings samples from the Pennsylvanian age rocks penetrated in thirty-five wells in east-central Oklahoma. He had recognized cyclical sedimentation in the Pennsylvanian and believed it to be a sound basis for correlation. The result was entitled "Report of Progress on Pennsylvanian Correlation in Oklahoma" dated May 4, 1931. He wrote:

"From the samples studies, detailed correlations were made by means of criteria which are believed to be directly related to the origin of Pennsylvanian rocks. The recurrence of these criteria, in rather definite sequences, indicate recurring conditions of sedimentatlon. These sequences, or cycles, are the bases of correlation. Practical value of such work can best be tested in areas where many wells have been drilled. If the principle of cyclical sedimentation is of value, correlation work can be extended and may perhaps be of help in wildcat areas."

The text of the report was 15 pages, followed by 100 pages detailing the logs of the 35 wells, with the cyclical correlations. What he learned from this study became an integral part of his methodology for the rest of his career and was passed on to many younger Gulf geologists and also a number of non-Gulf geologists that he came in contact with in later years. He eventually devised a personal method of logging the cyclical sediments in such a way that logs of wells some distance apart could be correlated based on the cycles.



Theory of Origin of the Cycle.- The basic theory of the cause of cycles is recurrent uplift of the land, erosion, and subsequent invasion of the sea. The resultant sediments are: a clastic series which is thought to be non-marine; an under clay and coal, which is considered to mark critical level conditions; and a marine series, resulting from invasion of the sea. Each of these three classed of sediments are theoretically supposed to consist of definite lithologic members, a sequence which is described by Weller as being the cycle sequence. This exact cycle sequence as defined by Weller is rare in Oklahoma but cycle sequences are present and are similar in principal.

Following the issue of the above report Max had no time to relax. He was sent to the town of Wall, S. Dakota, to log the Gypsy #1 Hunter, a wildcat well, which was started on May 2, 1931 and was completed, as a dry hole, on Nov 11, a total of 6½ months. During this period he worked alone, examining the drill-cuttings while the well was drilling. When he thought it necessary, he would take cores of zones of interest. He wrote daily progress reports and mailed them about every three days to Gypsy's Tulsa and Denver offices. He also express-shipped the bagged and dried samples to Tulsa and Denver every 4 to 5 days. Total depth was 5,001 ft. During the drilling of the well Max had no time off at all. This was one of

Inside the Gypsy Lab. L to R: Dr. Charles Ryniker, paleontologist; Albert Latta, geological technician; unknown geologist or technician (possibly Robert Walters). Seated: Dr. Max Littlefield, geologist. Photo taken in February, 1930.

the pioneering exploration efforts in South Dakota. Although the first well drilled in S. Dakota was in 1921, a successful oil producing well was not drilled until 1953, over 30 years later. In 1939, a summary of the sample log for the #1 Hunter well was published as a Geological Note in the August bulletin of the American Association of Petroleum Geologists.

In 1932, a son, Donald Roger Littlefield, was born on January 26 in Tulsa. Baby Donald died June 16, 4 months and 20 days old, of diphtheria. In 1934 Max wrote an article for Gulf's bimonthly employee's magazine, The Orange Disc. It was called "The Microscope Follows the Drill". In 1935 a son was born on October 21 at St. John's Hospital in Tulsa. When a hospital nun asked Lorraine what was the baby's name to be, she said it was to be Larry Dean Littlefield. The Catholic hospital people, however, took it on themselves to change that to Lawrence Dean Littlefield on the birth certificate.

In these early years regional geology was still in its infancy and oil company geologists were piecing it together using surface geological studies and well data. I came upon a 1937 letter from C. D. Cordry, who was doing similar work for the Texas Division of Gulf that Max was doing in Oklahoma.

In a letter written to Lorraine in early April of 1941, from Lexington, Kentucky, Max commented on the field geology study he and a younger assistant, were doing in Indiana and Kentucky. The geological section of interest in that area would have been the Devonian, Mississippian and Pensylvanian, the rocks of primary interest of Gulf's Tulsa Division, from Oklahoma northeast to Michigan and northwest to Montana. As well as working the outcrops, they also visited universities to acquire additional information on the geology. Max wrote:

"This has been the busiest week yet. Went to Indianapolis, then to Pendleton, then to Bloomington. Got in touch with a fellow to take us out on the outcrop and we went to Princeton to pick him up and then worked the outcrop from the Ohio River north to Geneva, near Shelbyville. Stayed in the lodge at Mascatatuck State Park, near Vernon. Drove down here Monday night in a fair rainstorm. Every time I go somewhere it rains or snows, and it snowed wet snow all the way from Bloomington to Princeton. We had nice weather for our field work, although a bit on the cold side. This is the Kentucky bluegrass country. The towns have quite a personality. The University is just so-so. We plan to be here until Friday night or Saturday noon and then will go collecting outcrop samples for three days and finish up at Indianapolis. The sample "man" here is a woman, Mrs. Freeman, and she is a good one. (in 1941 a female geologist was quite unusual). We wrangle over the Devonian like nobody's business. She is plain Kentucky with cracks like

"how are you all makin' out" for how are you getting along. The food is swell here. Real rancher's cooking. All the pictures on the wall are of horses. Man 'o War is the leading citizen. We (Allan Short is with me) should be back in Indianapolis about next Tuesday, leaving here Friday or Saturday."

In the early 40s, during the war, Max still had lots of home time and the family kept a large victory garden in the growing season. Max also built a hutch large enough to house 12 white New Zealand rabbits and, during the time of meat rationing, fried rabbit was common for Sunday dinner at the Littlefield house. Max and Lorraine played tennis and had a membership in the Tulsa Tennis club. Mary Jo caught on to tennis right away. Larry was too little for tennis yet, but he collected bottle caps and found a treasure trove of them at the club. When gasoline rationing came along, driving to the far south side of Tulsa was no longer practical, so the club membership was given up. The Gypsy lab building was only about ten blocks from home, so Max walked or rode a bike to work during the gas rationing years.

Gulf's Tulsa Division was responsible for mid-continent operations north of Texas. In the early 1940s there was a great deal of interest in the areas east of the Rocky Mountains in Wyoming and Montana. At the same time Canadian Gulf Oil Co., Gulf's Canadian subsidiary, covered Alberta east of the Canadian Rockies, underlain by similar geology. Max was an experienced field geologist, while at the same time was the Tulsa Division's carbonate rock specialist. So he spent much of the 1943 to 1946 period doing both field studies and sitting important wells.

In mid-July of 1943, Max made his first trip to Canada. The objective was field work to study and sample rock formations exposed, in the mountains, that might be expected in the subsurface in the plains of Alberta, Saskatchewan and Montana. He started in the Banff area. While away from Tulsa, Max wrote letters about twice a week to Lorraine. He also wrote about his work occasionally to his sister Ione, who lived in South Pasadena, California.

While working around Banff, he didn't have a car so he rode taxicabs out to the outcrops and had the driver come back to pick him up at 6:30 PM. It rained a lot while out on the outcrop and when it did he would hunker down under a pine tree and read the Life Magazine he carried in his knapsack. He finished up at Banff and another geologist, Bob Lockwood, came out from Calgary and they went up the highway to Jasper and did some field work just north of the Saskatchewan River canyon. After a few days break in Calgary, he and Bob then went down to Montana and met up with another two-man party working there. Max wrote:

"Came into the States at Coutts & Sunburst and headquartered in Choteau. We worked in the Canyons of the Sun, Teton and Birch rivers. This is all wild country, with no roads beyond the mouths of the canyons and few trails beyond. Did most of our work on horseback and some on foot. The mountains aren't so high, only a little over 8,000' but the relief is sharp and the country is rough and wild. The canyon mouths are about 4,000' elevation".

"We already had a field party of two men in Montana so we joined forces. Only two of us made the horse trips, however. They let us go without a guide, which was a real compliment as the dude rancher who rented the horses spoke of "wet nursing the easterners" and the troubles he had with people who couldn't ride. I had an old white plug who knew more about mountain trails than I did. I knew he knew more and shortly he knew that I knew that he knew more so we got along fine. We split up into two parties, one here in Great Falls & one in Helena and we will meet in Helena. We worked near Hughesville and Monarch, in the Little Belt Mountains; near Holter Dam, southeast of town of Wolf Creek in Big Belt Mountains; near Cardwell, in Tobacco Root Mtns and around Helena. Also visited the School of Mines in Butte. Bob Lock-

wood was called back to Calgary on Aug 20. Monday I go to Shelby & stay there a day to look at some samples. Then back to Calgary. My mail address will be the Calgary office".

In a letter to his sister on Oct 1, 1944, from Calgary, Max related his activity between late May and October. He spent two months (June and July) in Ottawa. This long period of time, far from the actual area of interest, was spent reviewing geological reports and examining samples from the archives and collections of the Geological Survey of Canada. He then spent 10 days in Moosejaw, Saskatchewan for similar research. He wrote:

"Messed around in Ottawa, Ontario, from late in May to July 25th. Came across Canada by train to Calgary and then back to Moosejaw, Sask., for ten days in early August. By Sept. 1st we got the field outfit organized and spent until the 29th in the mountains. Worked north from Banff, Alberta, to Jasper, Alta., mostly back toward the Alberta-British Columbia boundary. Spent some time near the headwaters of the North Saskatchewan River. It is a lusty, brawling, stream, starting on its way to Hudson's Bay. Just over the mountain pass, the Athabaska River starts out from under a glacier and takes off for its long journey *journey to the Arctic Ocean. Just to the west, over the comb of the range, the west-facing glacier's melt water finally gets to the Columbia River and the Pacific. There is a motor road from Banff to Jasper, well back in the mountains all the way. We could also drive some of the ranger trails and save steps. I'll move a lot of rocks and knock over a lot of stumps to save climbing 1,000'.*

Much of the country has been cut over near the road but back farther is virgin timber. Some areas of virgin timber are tough to travel unless there is a trail and it was sometimes easier to climb up and down rather steep rock faces rather than follow the timbered spurs. The last few days we spent near Brazeau, in the Foothills. The foothills are worse than the high mountains as they are heavily timbered and the rock outcrops are either covered by timber or too steep to climb. We had no roads in there, and rode horses along deer trails. The elk's antlers help to make a trail but a man on a horse is fighting limbs in his face all the while. A time or two we nearly got our horses bogged down in swamps. We worked without a guide, as our experience with guides taught us that they underrate a "tenderfoot" and will not go in many places which are a bit tough. We will go miles to get to a certain area as we have to see the type of rock there. It is all foolishness to a guide, who inevitably sticks to the good trails.

Statistics show I don't have too many years left for mountain work. Last year my average climbing rate was 1,000' per hour. This year it was 900'. Maybe helicopters will come in time to help me out. I can still go downhill with the best of them, though.

Will be in Calgary for about two weeks more and will then start home, with stops here and there".

Field work was carried on from Aug 8 to Oct 21. From Aug 8 Max was accompanied by younger geologists, Jed B. Maebius until Sept 16 and Paul Farmer from Sept 16 to Oct 21. Max and Jed drove from Tulsa through the Oklahoma panhandle, across the Las Animas Arch to Cañon City and Manitou, CO. This was an opportunity for Jed to observe Front Range structure and stratigraphy. A stop was made to make a check of Wyoming samples in the file of the Colorado School of Mines, at Golden. They then drove through Cheyenne to Casper, WY, where three days were taken to work samples on a recently completed Stanolind wildcat in the north end of the Powder River Basin. The trip resumed through the Wind River Canyon, where the pre-Cretaceous section was examined. Beyond Thermopolis several producing structures were reviewed and, enroute to Billings, MT, they detoured through the Prior Mountains. From Billings they proceeded directly to Butte, where they were joined by Dr. E.S. Perry and Dr. L L Sloss of the Montana School of Mines. Sloss had just completed field work on the Devonian as a

U.S.G.S. stratigraphic project. Under the guidance of these men they viewed Devonian sections in the Big Snowy, Judith, Little Belt, and Logan areas. A number of sections of other systems, from Algonkian to Tertiary, were observed or examined. Devonian sections in the Big Snowy & Little Belt areas were sampled. After a week in the field Drs. Perry and Sloss were returned to Butte. From Butte they drove to the Little Rocky Mts., taking one day to review previously sampled sections in the Sun River Canyon, in the area of closely imbricated overthrusts. In the Little Rockies, both Devonian and Ordovician sections, totaling about 700 ft in thickness, were sampled. Pre-Cretaceous sections were examined in several other localities. Tentative conclusions from the Little Rocky study and from the trip with Perry and Sloss , which had a bearing on the prospects of northeastern Montana, were written up.

Max continued to spend the rest pf 1945 in Canada. He sat on a discovery well near the townof Stettler, Alberta. During 1946 Max spent about half the time in Canada and half back in theTulsa Lab. He did some work on the Paleozoic of West Texas and New Mexico.Beginning in 1947, Lorraine began keeping a very brief daily journal which kept up with Max'stravels. With that source of information, it could be seen that Max's presence in Gulf's Alberta exploration program was much in demand, and that his work schedule gave him very little time to go home to his family.

In 1947, after spending the first two months working out of the Tulsa lab, he was called to return to Canada as they were preparing to drill a deep exploration well near the town of Pincher Creek, in southern Alberta. They wanted Max to be available to be at the wellsite for core and drill sample examination when the well reached the objective Mississippian limestones.

King Edward Hotel, Pincher Creek, where the family stayed in 1949

After two months in Canada, Gulf's international division asked him to make an urgent trip to Maracaibo, Venezuela. Mene Grande Oil Co., Gulf's Venezuelan subsidiary, had made a discovery in Cretaceous limestones in the Mara area, west of Lake Maracaibo. Although the company had been an important producer from Lake Maracaibo for many years, those oilfields produced from Tertiary, loosely consolidated sandstones. They were having problems with production from the newly discovered limestone reservoirs. As they were aware that Max was a specialist in limestones, and fractured reservoirs, they sought his help on an urgent basis. Max went to Maracaibo and spent 36 days examining and logging the cores and drill-cuttings samples for all of the wells drilled into the limestones up to that time. While in Venezuela, Max came into contact with a Creole Petroleum (Standard Oil of New Jersey) geologist named William Furnish, who much later became a geology professor at the University of Iowa. As soon as Max finished the work in Venezuela, he returned to Canada and spent the rest of the year there following the Pincher Creek #1 well, which reached the Rundle Limestone objective on Dec 28, and was a major gas and condensate discovery. Max remained in Canada until late June of 1948, when he had to return to Tulsa to have a gall bladder operation. When he was fully recovered, in September, he returned to Canada for a month and then was called to sit on a Gulf wildcat being drilled near Glasgow, Montana.

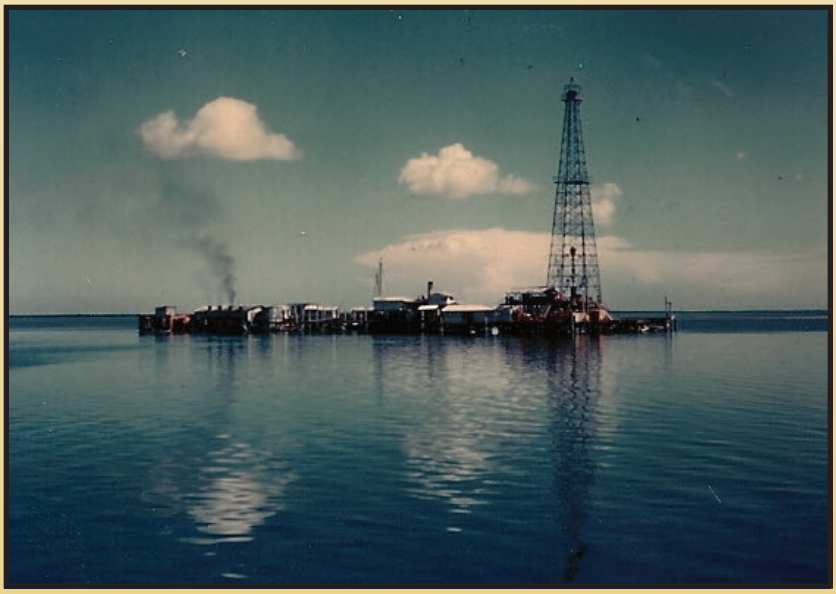
When that well was finished, at the end of 1948. He returned to Canada and stayed until mid-July of 1949. He then returned to Tulsa and gathered up his whole family, Lorraine, Mary Jo and Larry, and drove the family car from Tulsa to Pincher Creek, so they could spend a month together during school holidays. While the family was there they spent much of the month traveling in the mountains and enjoying the sights of the Waterton, Banff and Jasper National Parks, the town of Pincher Creek, as well as Calgary and Edmonton. During that period, Max was readily available to keep up with the drilling of the Walter Marr #1, a confirmation well for the Pincher Creek #1 discovery. In mid-August, Max and the family drove back to Tulsa.

The Walter Marr #1 well, Pincher Creek field, 1948

In a letter from Max to his sister Ione, he commented on the Walter Marr well, as follows:

"The Marr well is completed as far as drilling goes, 12,768'. I lived out there most of the time. We cored the 500 ft. of pay. It made gas and condensate on test and we burned a flare about 8o' high for several days while testing it. There were a few minor adventures with it, like gas getting into the water lines and burning up the boiler house, and a number of minor accidents and injuries. We are still working with it, testing it in order to understand its capacity to produce. Out on the plains we have two land sections in the Redwater Field and it looks like we would have about 25 oil wells out of the possible 32 locations. At Stettler, where we have the much publicized oilfield of our own, we are about to drill the second well. I cored in the discovery well, with the tests making 40 to 60 barrels per hour. Now completed, we opened it for a group of executives and it did 90 barrels in the first hour so we closed it in."

In early September, Max went back to Venezuela. They were drilling two exploration wells, Moga #1 and Melt #1 and were going to take a lot of cores and needed him to oversee them and log the samples and cores. In a letter to Lorraine he commented that the Moga well resulted in a discovery, and tested at a frightening 600 bbls per hour rate. The other well appeared that it would also be a discovery. He finished up his work there and left after 32 days. He returned with a 7-day stop at the New York office, then stayed at home in Tulsa only 5 days before heading off for Havana, Cuba, where Cuban Gulf Oil Co was doing surface-geology field work on the island. They were also planning to drill a deep offshore, well on the carbonate platform just off the north coast of



The Walter Marr #1 well, Pincher Creek field, 1948

Max in 1951 at the Blanquizal #1

Cuba. That well would be penetrating limestones, virtually from the surface to its total depth. What they called the FlorCuBahama area of interest was predominantly carbonate platform environments. He spent about a month there before returning, via the Miami and Pittsburgh Gulf offices.

After only a few days at home in Tulsa at the end of 1949, Max went to Tallahassee, Florida on January 1, 1950 and spent January to March studying samples from wells drilled on the Florida carbonate platform, which were stored at the geology department of Florida State University. He then returned directly to Cuba for three months. He then spent 30 days in the New York office and while there the family drove from Tulsa to New York to be with him during that time. He had spent only 20 days at home in the previous 10 months. After driving back to Tulsa with the family, he returned to Cuba.

Max worked in Cuba from July 29 to Oct 9. He then went from Cuba to British Honduras (now Belize) for a month to assist Giovanni Flores, the Gulf geologist, there. They traveled up some of the rivers there to examine and sample the carbonate rock outcrops in the uninhabited jungle hills of the western side of the colony. He then returned to Cuba and stayed there for the rest of 1950.

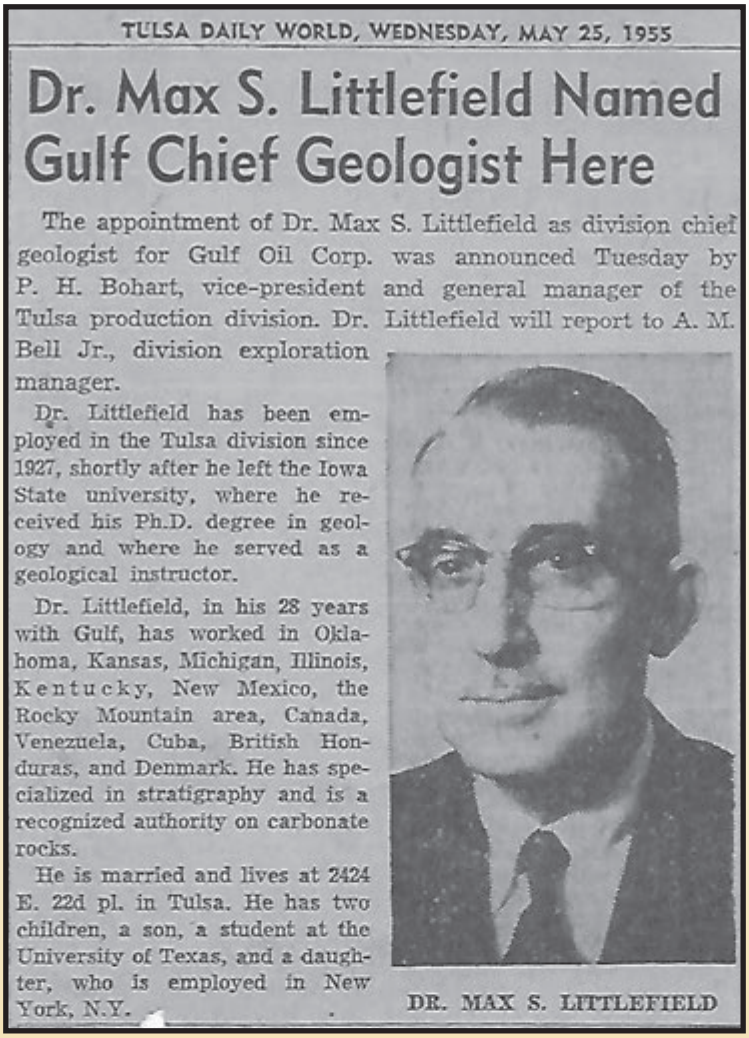
Max worked in New York until early March of 1951 when his mother passed away. Max and Lorraine spent a week in Iowa for his mother's funeral. He then went back to New York for a month and then returned to Cuba in April. The Blanquizal #1 offshore wildcat well was spudded April 24, 1951. In June, Lorraine and son Larry (15 years old) drove to Miami and took the P & O "Florida" car ferry to Havana. The family stayed there together until mid-August. Daughter Mary Jo, who was at that time working for the JW Thompson advertising agency in New York, flew down to Havana to spend her two-week vacation with the family. While the family was there Max continued to oversee drilling of the Blanquizal #1.

Max continued to work in Cuba until after the Blanquizal well was abandoned in February 1952 He flew to New York to pick up some cold weather clothes that had been sent there from Tulsa by Lorraine. He then flew to Denmark to study cores, cuttings and porosity & permeability results from the Tonder By #1 well in southern onshore Denmark. He was there for 36 days. Between mid-March and mid-May he spent several two-week stays in New York, Tulsa, Calgary, Tulsa, Pittsburgh, New York, Tulsa. In late May he went back to Canada. Lorraine and Larry drove up to Canada in early July and stayed until Aug 21, when the family drove back to Tulsa together.. Max stayed in Tulsa for 29 days, then sat a drilling well in Gillette, Wyoming for 33 days, visited Casper Wyo. For 21 days then back to Tulsa for a week before returning to Canada for the rest of 1952.

In 1953, from January to mid-October, Max alternated 2 to 3 week stays in Calgary and Tulsa. Somewhere in this period, Gulf's Italian company shipped some cores from wells in the Ragusa Field in Sicily. That field, which was a Gulf discovery, was the largest in Europe until the discoveries were made later in the North Sea. They sent the cores to Tulsa so they could be worked over by Max. Because Max was busy during the week, he decided to do the Ragusa cores on a Sunday, and drafted his son Larry, who was still in high school, to carry the 5-foot long boxes from the storage racks to where Max set up his microscope.

And return each box when he had finished it. It was not the ideal Sunday for Larry, but as Max was doing what he loved to do, it was a chance to do something interesting instead of possibly mowing the lawn at home.

In September, 1953 he was appointed to a newly created position as Division Research Geologist for the Tulsa Division, based on "his regional knowledge of stratigraphy, tectonics and geophysics". Max's travels for the rest of the year were limited to very short visits to District offices. At the end of the year he spent 53 days in Tulsa, the longest period of time he had had at home for several years. During 1954 Max spent 300 days at home while making seven short trips to district offices at Billings MT, Saginaw MI, Wiliston ND and Evansville IN.



TULSA DAILY WORLD, WEDNESDAY, MAY 25, 1955

Dr. Max S. Littlefield Named Gulf Chief Geologist Here

The appointment of Dr. Max S. Littlefield as division chief geologist for Gulf Oil Corp. was announced Tuesday by P. H. Bohart, vice-president and general manager of the Tulsa production division. Dr. Littlefield will report to A. M. Bell Jr., division exploration manager.

Dr. Littlefield has been employed in the Tulsa division since 1927, shortly after he left the Iowa State university, where he received his Ph.D. degree in geology and where he served as a geological instructor.

Dr. Littlefield, in his 28 years with Gulf, has worked in Oklahoma, Kansas, Michigan, Illinois, Kentucky, New Mexico, the Rocky Mountain area, Canada, Venezuela, Cuba, British Honduras, and Denmark. He has specialized in stratigraphy and is a recognized authority on carbonate rocks.

He is married and lives at 2424 E. 22d pl. in Tulsa. He has two children, a son, a student at the University of Texas, and a daughter, who is employed in New York, N.Y.

DR. MAX S. LITTLEFIELD

On May 25, 1955 Max was appointed division chief geologist for the Tulsa Division. For the first time since he started work with Gypsy Oil Co. in 1927, his office moved from the Gypsy Lab to Gulf's Division offices at 4th & Main Streets in downtown Tulsa. The Gypsy lab building was closed down to be eventually sold. Max was involved in shutting it down and rescued, from a trash bin, the small watercolor picture of "The Gypsy", the sailboat owned by Frank Leovy, who founded the Gypsy Oil Co. in 1907 .From that time to mid-1958, Max was in management jobs so he had little opportunity to do hands-on geology work, which was what he loved to do. However, he was able to spend most of his time at home in ulsa, with numerous very short trips to visit district offices. He and Lorraine took up bowling at the insistence of some of their friends, and found that they enjoyed it.

In June of 1956 Max was made exploration manager for the Tulsa Division. In mid 1958 there was a major reorganization within Gulf. One of the results was that a Rocky Mountain Division was created with its headquarters in Denver. It would take over activities in Colorado, Wyoming and Montana and related areas that had been part of the Tulsa Division. The Tulsa Division headquarters was to close and a new Midwestern Division, to handle what had been the eastern part of the Tulsa Division, would have its headquarters in Oklahoma City.

Max was faced with the unhappy, and non-productive, responsibility of letting go a number of long-time Tulsa employees. Once the smoke cleared from the closing of the Tulsa office, Max was transferred to Gulf's International Division in New York as a senior staff geologist. With all the international work he had done on loan from the Tulsa Division, Hollis Hedberg, Gulf's chief geologist for worldwide operations, wanted to have him on their staff as an international trouble shooter, especially with respect to carbonate rocks. The New York office was located at 17 Battery Place, in downtown Manhattan.

Between August and November of 1958, although Max spent 25 days in British Honduras, and 12 days in Cuba, he and Lorraine managed to sell the Tulsa house, lease a house in Westfield, New Jersey and pack up and move. On the day after their shipment was moved into the Westfield house, Max left for Houston for 8 days to work a core Gulf had shipped there from Kuwait.

In June of 1959, Max & Lorraine bought a house at 20 Mohawk Trail in Westfield, and moved in on July 3. During 1959 and early 1960, Max worked in New York and worked on cores from wells drilled in British Honduras. He began a study of Trinidad to evaluate the oil possibilities of the shallowwater, western side of the island. He also worked on the FlorCuBahama area and visited the offshore rig which was drilling the Cay Sal exploration well, which was being drilled by Gulf and Standard of California.

In early 1960, Max was sent a copy of a report issued by Gulf Research & Development Company, Gulf's research lab in Harmarvile, PA, the subject being Fluid Behavior in the Florcubahama Area. Max saw fundamental problems in that study and wrote a memo to the lab with comments on those problems. The writer of the original report recognized that Max's comments were valid, were very important with respect to the subject at hand, and issued a new, five-page document based on Max's memo. This was then passed on to the New York exploration division in which the lab essentially said they needed to go back to the drawing board.

In June of 1960 he was sent to Spain to assist the Spanish Gulf Oil Co, (Spangoc) which was a non-operating partner in a concession in the basque area of northern Spain. Although Gulf was not the operator, they provided geological and drilling support to CIEPSA, the operator. He spent from June to October in Vitoria, Spain, working the cores and samples from all the wells drilled in the concession and oversaw the drilling of wells while he was there. At the end of the year he spent a month in Calgary.

From May to November of 1961, Max spent 198 days in Tripoli, Libya to support Gulf Oil Co. of Libya's management in planning to acquire new acreage. During the course of this study, Max logged a total footage of 100,846 ft. of cores and drill samples in 156 days, or an average 642 ft/day. Seven long, detailed, monthly reports were written.

In late November Max applied for early retirement and was officially retired November 30, 1961.

In mid-March of 1962, Max went back to Vitoria, Spain at the request of the Spanish company, CIEPSA, to continue working on their wells. They had two rigs running at the time. He stayed for about 6 months and they were drilling nicely on the current well when he left. It is interesting in retrospect that the small gas field that was discovered was in a fractured shale formation and production was very erratic. Of course in the present day that field could be drilled horizontally, and fracked, and might produce enough gas to run the Basque country for years. On recently googleing "gas production near Vitoria, Spain", however, the most notable article found was about a local outcry against fracking.

The CIEPSA contract work was Max's last geological activity and he completely retired. He and Lorraine enjoyed a quiet life in Westfield, New Jersey after that. Their house had a big backyard and in the growing season they had a very large vegetable garden and many flower beds. Max went back to bowling a couple of nights a week. Lorraine had gotten to be a regular bowler, especially during the time they were living in Westfield, as bowling seems to be a popular pastime in New Jersey. They were also happy that their daughter Mary Jo was working in Manhattan and she and her apartment mate spent many of their weekends out in Westfield, helping with the garden and enjoying some time away from the city. Larry, who was

working overseas, was able to spend his annual vacations there and at those times the entire family could be together.

In December of 1966 Max wrote a long letter to his sister Ione which included several pages about Pilot Rock and the Sioux Quartzite, including some of the glacial history. It also includes notes on a visit Max made to the lady who, at that time, owned the property which includes Pilot Rock.

Max began to have shortness of breath, when he did unusual exercise, like mowing the lawn, or climbing the stairs to their usual bowling alley, which was on a second floor. He had been a heavy smoker for his entire adult life. He bought a riding mower, as their yard was quite large. He realized that he was suffering from emphysema and finally stopped smoking in about 1964. In early December of 1967, Max came down with bronchitis, which combined with his emphysema made breathing very difficult and he was hospitalized. A tracheotomy had to be done and he was put on oxygen. At one point his breathing stopped and his heart stopped for about a minute before it could be re-started. Respiratory failure then caused a cascade of other internal problems and Max died December 24, 1967. In a few days, Larry flew in from Angola, and Lorraine, Mary Jo and Larry carried Max's ashes back to Tulsa to be interred in the cemetery plot where baby Donald Littlefield had been buried.

The family and friends established a memorial Geology Fund at the University of Iowa, the purpose was, and is, to encourage meritorious field studies at both the MS and PhD levels. In addition to the initial contributions by family and friends, a number of contributions were sent by geologists who had known, or worked with, Max over the years. When Lorraine passed away in January 29, 1992, the fund became the Max and Lorraine Littlefield Geology Fund. Lorraine was an important part of Max's education and career and some of their happiest years were at Iowa City.

A Gulf geologist, who idolized Max, accepted the task of preparing the memorial for him to be published in the Journals of the American Association of Petroleum Geologists (AAPG) and the Geological Society of America (GSA). Max was a Fellow in both organizations. Unfortunately the memorial was not completed before the writer passed away. the Littlefield family did receive copies of a number of letters written to him by geologists who were familiar with Max's work. There were many who wrote that their experience with him made a lasting impression on them as geologists.

When young Max headed for Iowa City in 1919 to enroll in the University of Iowa, he thought that chemistry would be interesting, as he had been slightly exposed to it in the previous year while at Buena Vista College. Although he got a B.A. in chemistry in 1922, I guess he must have taken a general geology course along the way and decided he was more interested in geology. He then came under the influence of Chester Wentworth and professor A. C. Trowbridge. I think those two men were responsible for instilling in him the love of geology that he had for the rest of his life.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Parasequences? What's That?

Max Was a Pioneer Stratigrapher

Max Was a Pioneer Stratigrapher, by L. L. Sloss, Northwestern University.
Article in the AAPG Explorer Magazine for November, 1996

A TRIBUTE TO DR. MAX LITTLEFIELD, EMINENT STRATIGRAPHER

Recently I had the opportunity to peruse a report by Dr. Max Littlefield written in 1944 for the Gulf Oil Corporation, Gypsy Division and its Canadian affiliate Canadian Gulf. That report, a regional study of the Mississippian stratigraphy of Southern Alberta, Montana, North Dakota, Saskatchewan and Manitoba is based on a study of outcrop sections and well cuttings in those areas. With the very limited control points available at that time the report represents an astute regional analysis and is evidence of the skills and insight of this topnotch stratigrapher who demonstrated a remarkable insight of the stratigraphy and lithological variations of the Mississippian strata in the Northern Plains. Regional correlations using **cycle sequences** and recognition of the value of sequences and cycles in studying both lateral and vertical facies associations attest to the skills of this outstanding oilpatch stratigrapher of the 40's and 50's.

Two sections of the report entitled "Lithologic Types in the Mississippian of the Northern Plains Area" and "Deposition" are typical segments that highlight its usefulness. The two segments portray the early recognition and use of lithologic cycles and sequences as a useful tool in stratigraphic analysis and clearly indicate that the concept of sequence stratigraphy as practiced today by stratigraphers throughout the world actually was used by such men as Max Littlefield in the 40's and 50's.

The report discusses the distinct depositional pattern or vertical sequences, designated as cycle-sequence, and describes the several lithologic types that are the building blocks with which "patterns of Paleo-geography are constructed".

The rock types in vertical sequence range upward from a basal "fragmental and normal marine" limestone through a finer grained "denser fine-grained lime mud" to a more evaporitic facies with anhydrite and evaporitic dolomite, a typical shallowing upward cycle or sequence. Incomplete cycles such as dominantly evaporitic or dominantly fragmental limestone are interpreted due to variables including depth of water or changes in "relative sea level". The cycles are considered to be "of regional significance where control is widely spaced and are used as criteria" for regional correlation where reliable time markers are not known nor recognized".

My personal association with Max Littlefield was relatively short, but I always remember him as a brilliant and painstaking interpreter of the rock record in outcrop sections, well cuttings or core examination and especially his skill in developing a valid regional perception based on sparse lithological control.

Dr. Littlefield was educated in Iowa, and his active geological career spanned most of the period from the thirties in to the sixties. He was internationally recognized and in demand within the Gulf Companies as well as by competitors such as Imperial, especially for his expertise in carbonate rocks. However, as his geological contributions were classified internal Company documents, he was not widely known to the general oil exploration fraternity.

Those of us who were privileged to work with Dr. Littlefield in Gulf, and in other Companies, benefited greatly from the association with this outstanding stratigrapher, and we hereby pay him tribute.

Andrew D. Baillie

Canadian Society of Petroleum Geologists - CSPG Reservoirs, Vol 23, No. 6, June 1996.
A Tribute to Dr. Max Littlefield, Eminent Stratigrapher, by Andrew Baillie

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February 23, 1996

Larry D. Littlefield
3050 Ascot Drive
San Ramon, CA 94583

Dear Mr. Littlefield:

I am an old [non-Gulf] colleague and great admirer of your late father, Max. He and I worked on mutual problems in the mountains and subsurface of Montana long ago and I have always felt that I learned more real stratigraphy from him than from all the courses and books I encountered. Now I am faced with an obligation to address an audience in Ames, Iowa, and tell them what great stratigraphic truths emerged from studies in the Great American Heartland. I have sent in an abstract noting the contributions of the likes of Twenhofel and Wanless and others that everybody free of Alzheimer's knows about and all the time I keep feeling that folks in Iowa should know more about Max Littlefield who was better than any of them. Just maybe, I'll pull a switcheroo (I'm old enough to get away with it), skip the old geezers, and re-introduce them to Max; in any case, I'll get a Littlefield-appreciation piece into print, one place or another. Meanwhile, I've been talking and writing to Mel Hill (Corona) and John Andrichuk (Calgary) They say "talk to Larry"; so, if this makes no sense to you, it's their fault.

John has sent me a few of Max's complex sample logs and these confirm my long belief that Max was doing cyclostratigraphy (=sequence stratigraphy) at least twenty years before the thoughts expressed in Memoir 26 were formulated at the old Carter lab in Tulsa. The most important of his findings was the ability to correlate from shelf to basin, from one facies to another, by identifying carbonate-evaporite cycles. I can demonstrate this with a couple of Montana logs but I wonder if you have more --?

Then, I need to know how Max got to Iowa City for his doctorate -- the locals will want to have that (and so do I).

Finally, I need a picture of your father, mustache in place and fire in the eyes. I have a shot (courtesy Andrichuk) of Max getting an award of some sort (25 years?); the picture is not bad but it is polluted with Gulf Canada vice presidents. Can you do better?

I'll be interested in your thoughts, additions, subtractions, whatever. You should feel free to call me at 847-491-7539 -- I won't guarantee to be there but you can leave a message on the box and I'll get back to you.

Cordially,

Larry

L.L. Sloss

C A S
COLLEGE OF ARTS AND SCIENCES

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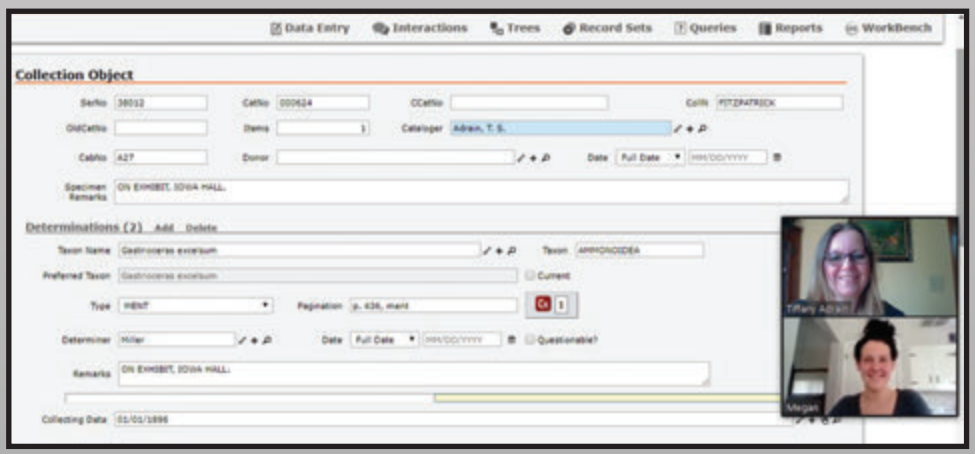
Letter from L. L. Sloss, Geology Dept, Northwestern Univ. to Larry Littlefield

News from the Paleontology Repository (Home Office edition)

by Tiffany Adrain, Special Collections Manager

The students' time sheet on the back of the Paleontology Repository door marks the day (Friday March 13, 2020) that my interns and I hastily packed up our projects and headed to shelter from the Covid-19 pandemic. We thought it would be for a few weeks, but then the internships were terminated and that was the last time some of us saw each other. I thanked those graduating students and wished them every success. I stayed at home, working. How does one work remotely with a fossil collection that would obviously require the Collection Manager's presence? One year later, the Paleontology Repository is a thriving center of virtual curation, engaging students from their homes in Iowa City, across the US and around the world! Museum Studies interns and EES volunteers have transcribed thousands of scanned collection catalog cards, georeferenced hundreds of collecting localities, scoured the internet for recent research publications citing our SUI specimens, prepared lists of these specimens for data entry, and researched biographies of the Paleontology Repository's collection donors and collectors. As you can imagine, our public and school outreach has been vastly curtailed by the pandemic. However, long-term volunteers/interns and now employees, Madi Ide and Frank Pan are working on a new book for 5th-6th graders about fossil hunting and I have been assisting the Mid-America Paleontology Society as they relocate their 2021 fossil Expo to Springfield, Illinois after 10 years in Iowa City. Madi also created an entirely new website for the Repository for a Museum Studies Internship. Look out for a link to it on the EES department website under Facilities. Behind-the-scenes running of the collection has included finalizing the transfer of Emeritus Prof. Ann Budd's NMITA (Neogene Marine Biota of Tropical America) database and website – which is a substantial collaborative project – to the University of Miami for hosting and future development, and the implementation of the latest version of the Repository's "Specify" specimen database on a new server along with the setting up of associated web applications. Interns can now enter data via a web browser rather than having to log on remotely to one of the Repository's computers. Specimen loans and rock and fossil ID enquires continued throughout the year.



Screen capture of Museum Studies student Megan Campbell and Tiffany Adrain working remotely on our specimen citation project

Dr. David Peate and Associate Dean for Research Josh Weiner have been incredibly supportive of the paleontology and other EES research collections and identified improved facilities to rehouse and better protect collections currently stored on the Oakdale campus. I am now participating in an online course about moving museum collections and can honestly say that even with over 40 tons of collections to move next year, it'll be a much easier task than moving the contents of an art or historical museum. That reminds me - look out for the grand opening of the UI Stanley Museum of Art late next year, 14 years after the 2008 flood devasted the UI arts campus and closed the previous museum. Talking of floods, as a member of the Iowa Museums, Archives and Libraries Emergency Response Team (IMALERT), I was called to help deal with a potentially catastrophic pipe leak at the UI Museum of Natural History in Macbride Hall. Water had been cascading like a waterfall over the stair well and pouring from the ceilings into the collection rooms. Detailed inspec-

Student Receives Fulbright Research / Study Award

Undergradute major Megan Lenss received a Fulbright Research / Study award to conduct a project entitled "Understanding the Ocean's Carbon Sinks: Phytoplankton in the Weddell Sea, Antarctica." The Weddell Sea is the second-largest carbon reservoir on the planet, and phytoplankton are the main source of carbon sequestration in the Weddell Sea. As the phytoplankton photosynthesize, carbon is incorporated into their cellular tissues. When the phytoplankton die they sink to the bottom of the sea, and thus the carbon in their tissues is caught in the Antarctic bottom water where it is sequestered for thousands of years. However, the Weddell Sea is a seemingly nutrient restricted zone and the work she will be doing will seek to understand when, where, and why phytoplankton blooms occur in the Weddell Sea. Megan will be working in a team of researchers from the Norwegian Polar Institute and the University of Tromsø in Tromsø, Norway. Her project is a part of a larger initiative of the Norwegian Polar Institute that is seeking to create a marine protected area in the Weddell Sea. Megan is very excited for this opportunity because it will allow her to grow both personally and professionally and will be a great jumping point for a future PhD. She is incredibly grateful for her time in the U-Iowa EES Department and especially would like to thank Drs. Brad Cramer, Jane Gilotti, Jeff Dorale, and Kate Tierney for their support throughout her undergraduate career.

Paleontology Repository (continued)

tion of the interior of the museum-grade cabinets revealed that not one feather of the priceless bird collection had been dampened. The cabinets saved the collection from catastrophe. I will be looking for funding for this type of cabinet to house the paleontology and EES collections in the new facility, to provide security, and protection from pests, temperature and humidity swings, dust, water, and even fire. Please do not mention derecho. At least the new building survived it!

Having been vaccinated against Covid-19, I'm now looking forward to returning to the collections on a more frequent basis than my pandemic evening and weekend stealth visits and working directly with students again. While virtual projects are great for students who are off campus and will continue to be offered, there is nothing like the incredibly valuable hands-on experience of working with collections in-person. This is vital for any student wishing to manage or use scientific research collections now or in the future. I am always interested to hear of funding opportunities to support interns working in the collections or making conference presentations about their work. Thank you to everyone who supports the Paleontology Repository, and especially the students who devote such immense time and effort working here, particularly under pandemic conditions.

Special thanks to (repeated names = multiple projects):
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Museum Studies Interns: *Elizabeth Baker, Madison Mueller, Jacob Verplaetse, Madi Ide, Drew Collett, Hannah Osborn, Meghan Schilla, Alyssa Grady, Jude McDonnell.*
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Anything you would like to see in the newsletter? Please send an email with any suggestions or requests to geology@uiowa.edu!

Share your perspective

Please share the wisdom you've accrued throughout your career with our students by answering one or more of the questions below, or dispensing any other advice you may have. Your responses will be included in the Alumni Perspectives in the next newsletter. Send them to geology@uiowa.edu and indicate whether you would like it to be anonymous or attributed to you. Thanks for sharing!

What made you competitive in your field?
What were your lucky breaks?
What type of preparation would have made your career path easier?