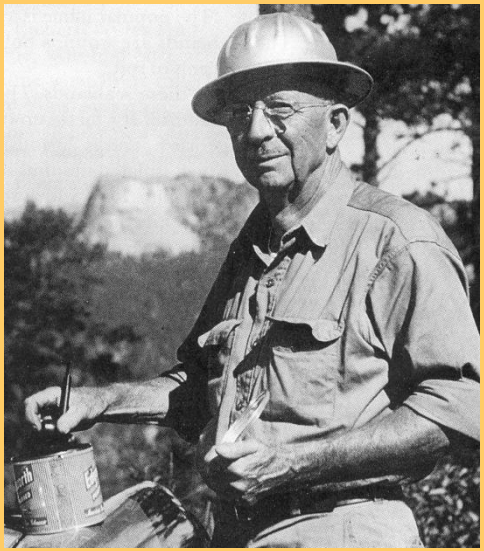
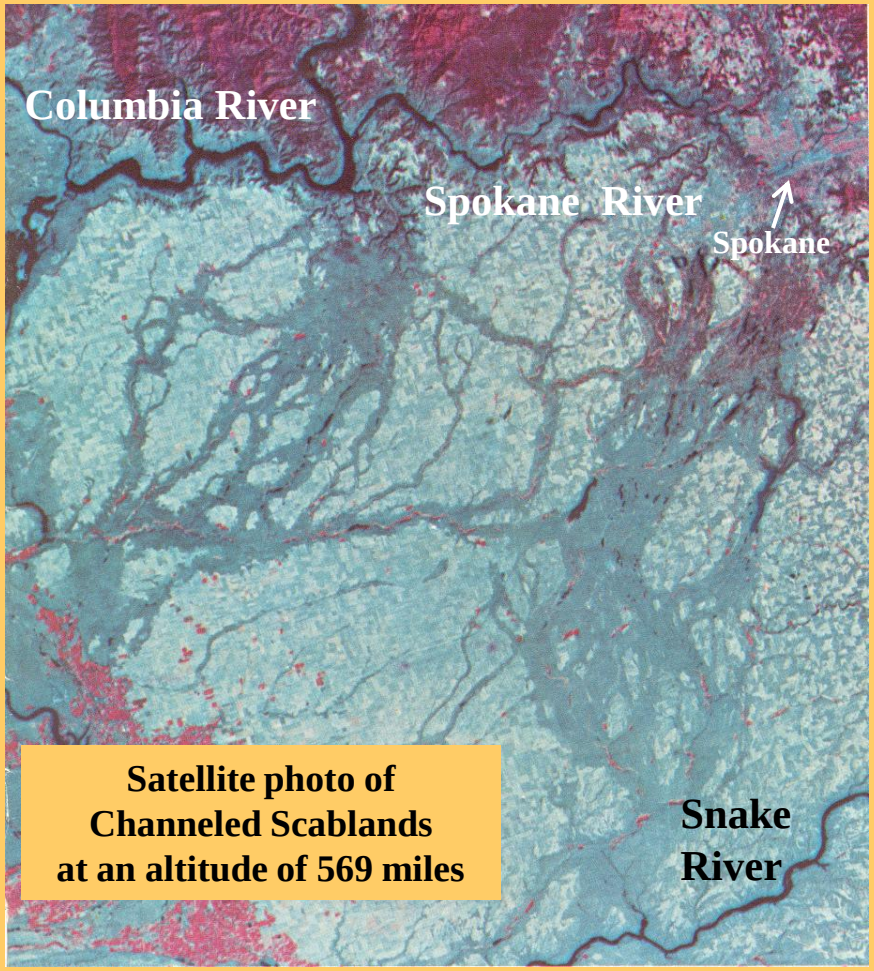
DEPARTMENT OF GEOLOGICAL SCIENCES
COLLOQUIUM PRESENTATION

FEBRUARY 5, 2008

THE OUTRAGEOUS HYPOTHESIS OF J HARLEN BRETZ, 1905



BRETZ, AGE 67, AT MOUNT RUSHMORE, 1949. Julian Goldsmith photo.



Satellite photo of Channeled Scablands at an altitude of 569 miles

A PERSPECTIVE ON THE LIFE OF A WORLD RENOWNED GEOLOGIST AND TEACHER

LAWRENCE D. TAYLOR, Ph.D., PROFESSOR EMERITUS
DEPARTMENT OF GEOLOGICAL SCIENCES
ALBION COLLEGE

HIS CHARACTER

"He had a robust and, as he put it himself, "recurrent earthiness" in his sense of humor and a Socratic method of teaching that included biting rejoinders to students whose answers were sloppy." Michael Parfit, Smithsonian Magazine.

"Much like the landscape he clearly loved, Bretz was an odd mix of polish and roughness. Independent, and a showboat fond of dirty jokes, he also was a deep thinker and uncommonly eloquent." Graig Welch, Seattle Times.

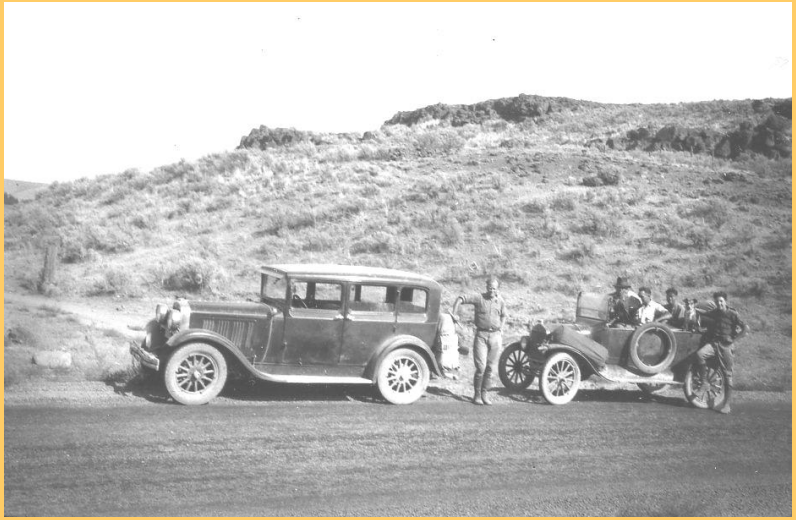
"In some of his early photographs he wears a brusque mustache and stern eye. He looks like a prosecuting attorney." Richard Waitt, U.S. Geological Survey

"…we were carefully and forcefully reminded by Dr. Bretz that there was no period after the "J" in J Harlen Bretz. Like the "S" in Harry S Truman, it stood for nothing. In a very real sense, the absence of that period is symbolic of the man's tireless insistence on accuracy and his remarkable ability to stem the tide of scientific convention for so much of his professional life." P. Geoffrey Feiss, College of William and Mary.

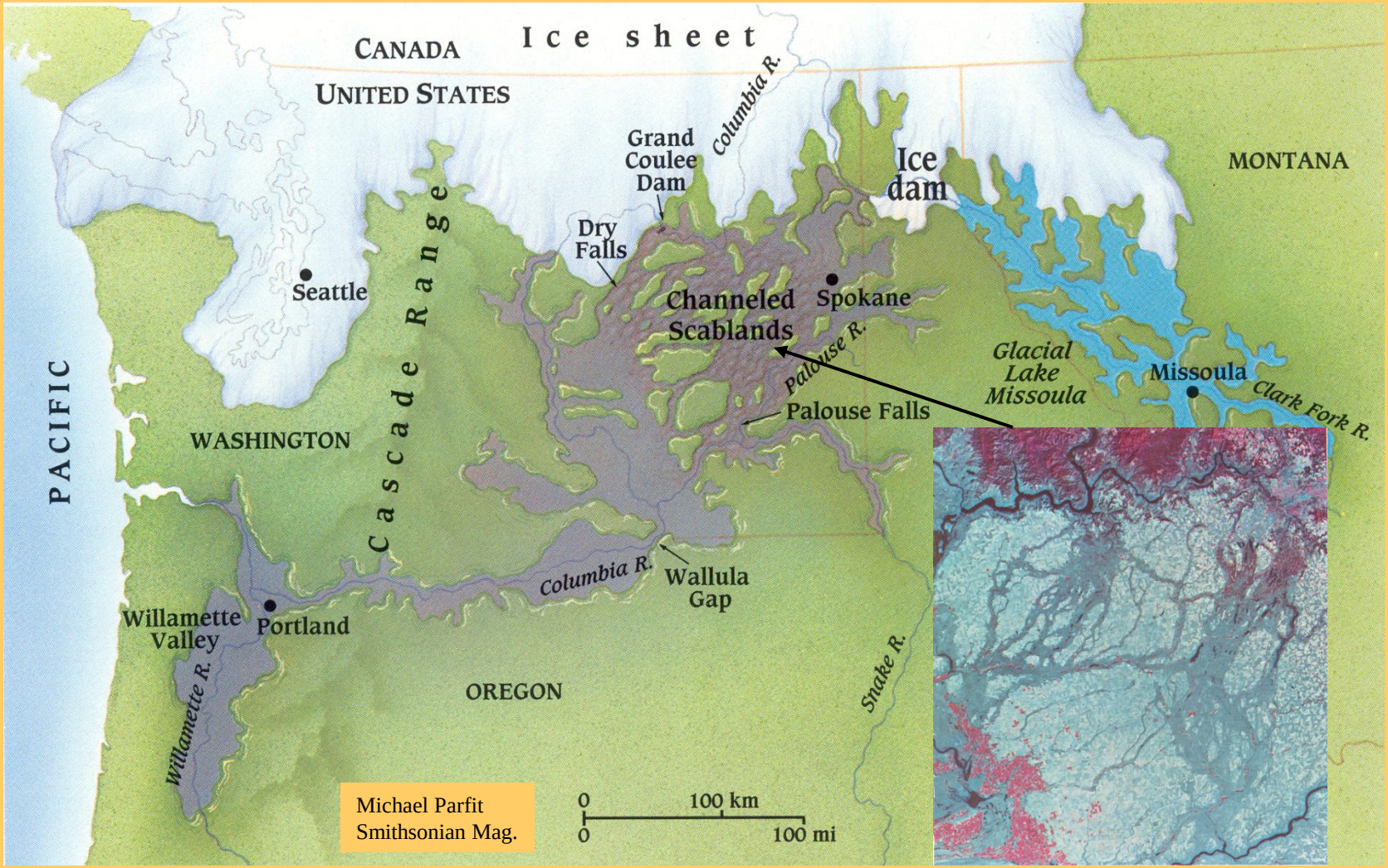
WHAT PATH DID THIS MAN TAKE TO BECOME A WORLD FAMOUS GEOLOGIST AND TEACHER?

HOW WAS HE ABLE TO RECOGNIZE, FROM ON FOOT, A TERRAIN OF MONSTER FLOOD CHANNELS, WITHOUT THE AID OF MAPS, AERIAL PHOTOGRAPHS, AND SATELLITE IMAGES?

Doc Bretz and colleagues at the Spring Coulee



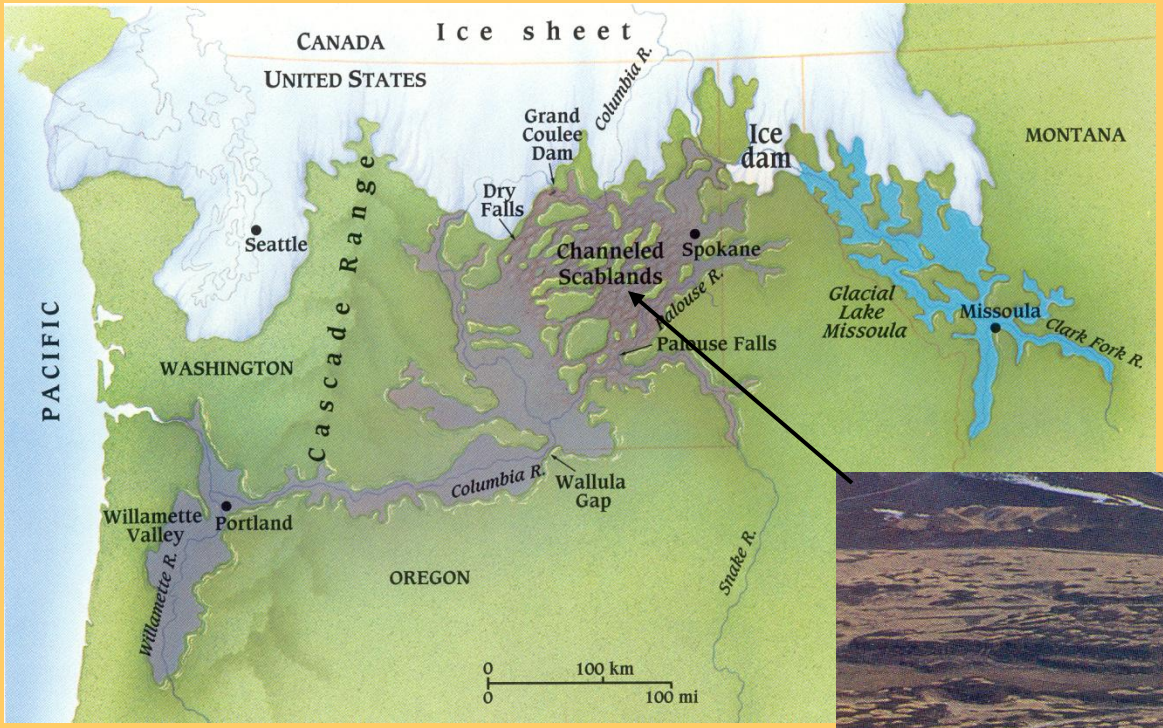
Doc Bretz’s field vehicles



Map shows position of the ice sheet around 15,000 years ago. An ice dam blocked the Clark Fork River to form Glacial Lake Missoula. When water breached the dam, a flood spread over Washington and Oregon and roared down the Columbia River.
From "The Floods That Carved The West" by Michael Parfit, Smithsonian Magazine, Apr. '95.

Ted Wood photo
Smithsonian Mag.

These huge potholes on the edge of the Quincy Basin gave Bretz the first clues that an event of catastrophic proportions had occurred.

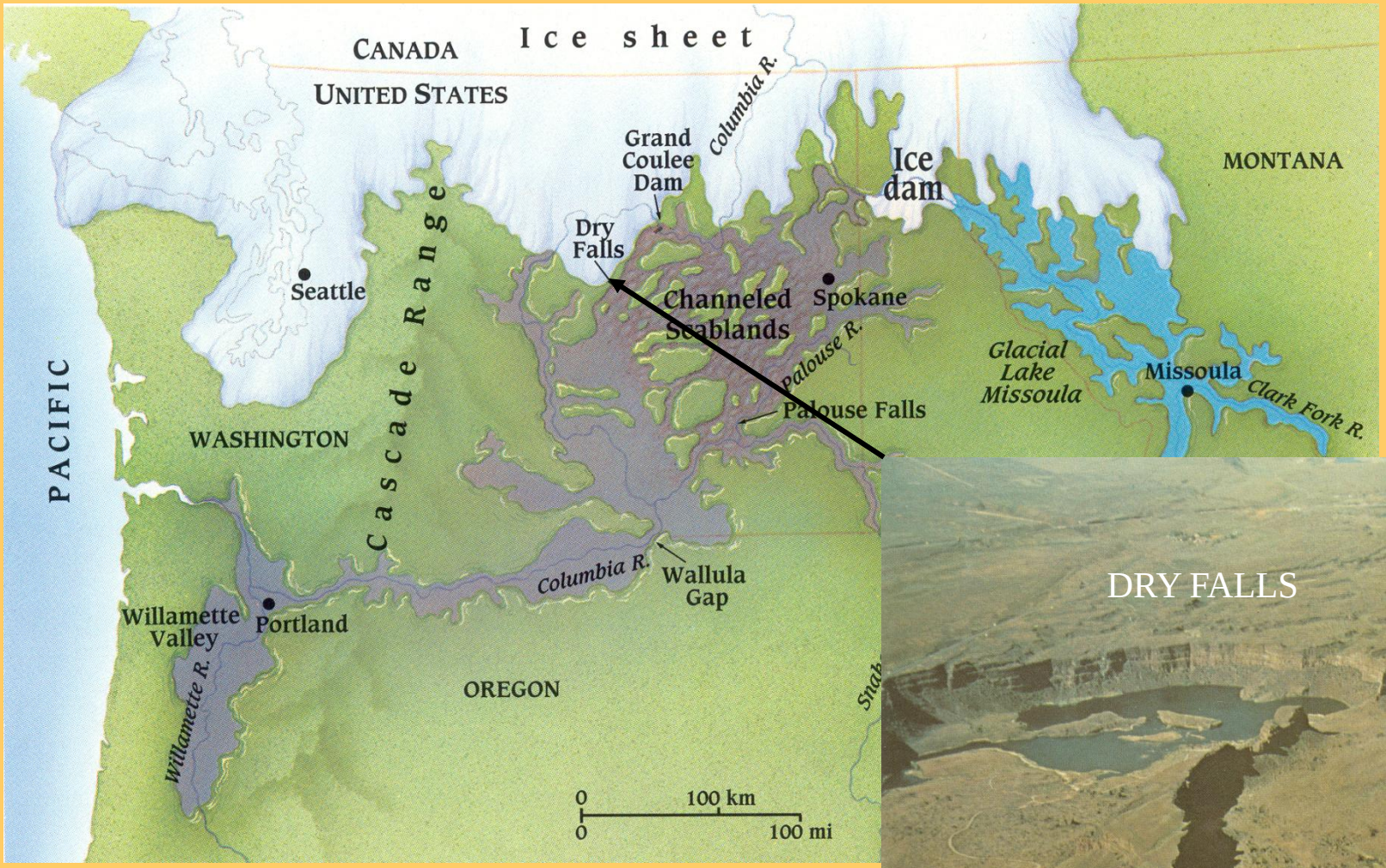


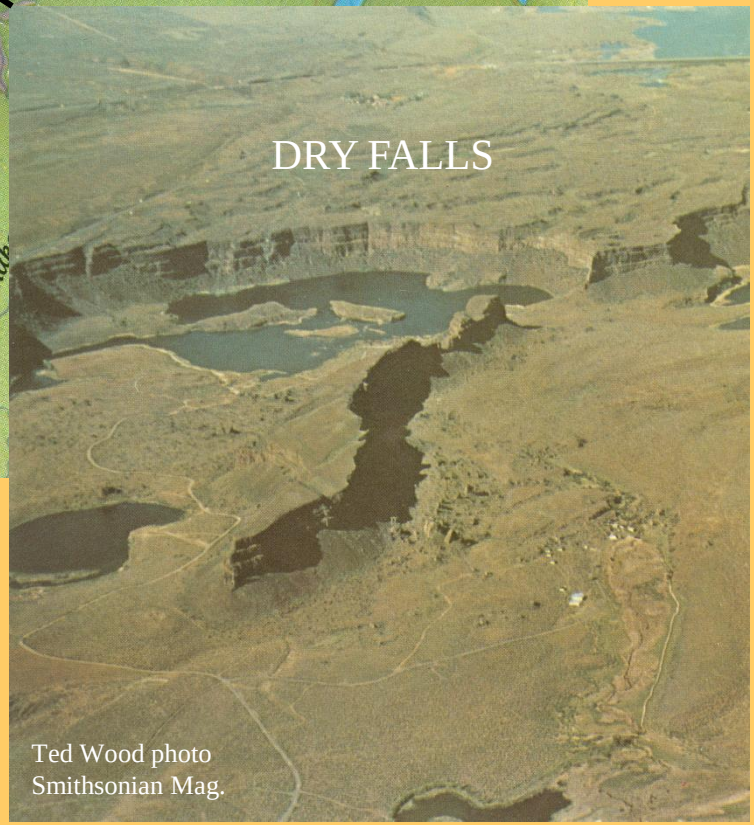
The Cheney-Palouse Tract where basalt bedrock is scoured into channeled and scab-like features by the Missoula flood.

"The scablands are wounds only partially healed…in the epidermis of soil." Bretz.

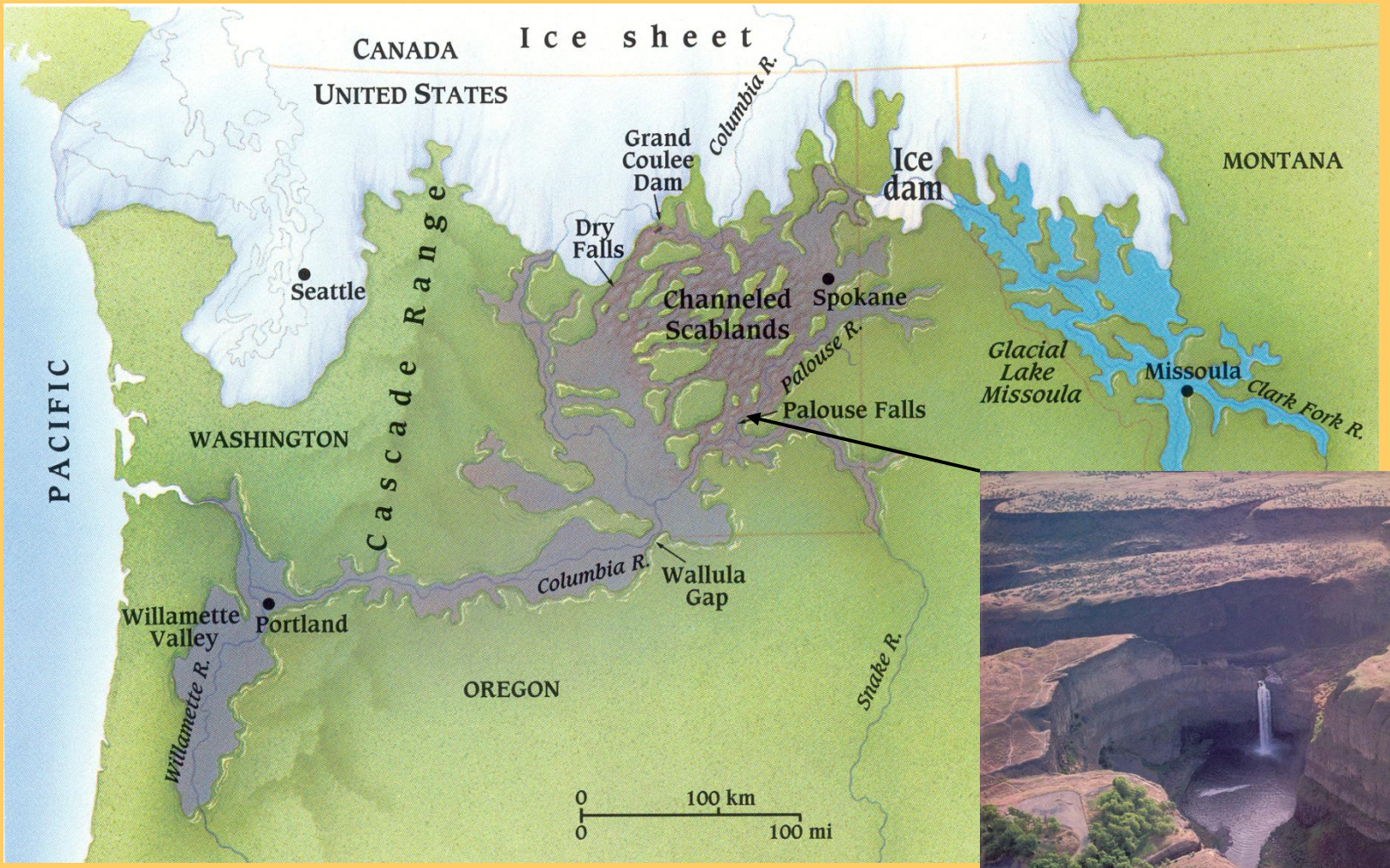
Ted Wood photo
Smithsonian Mag.

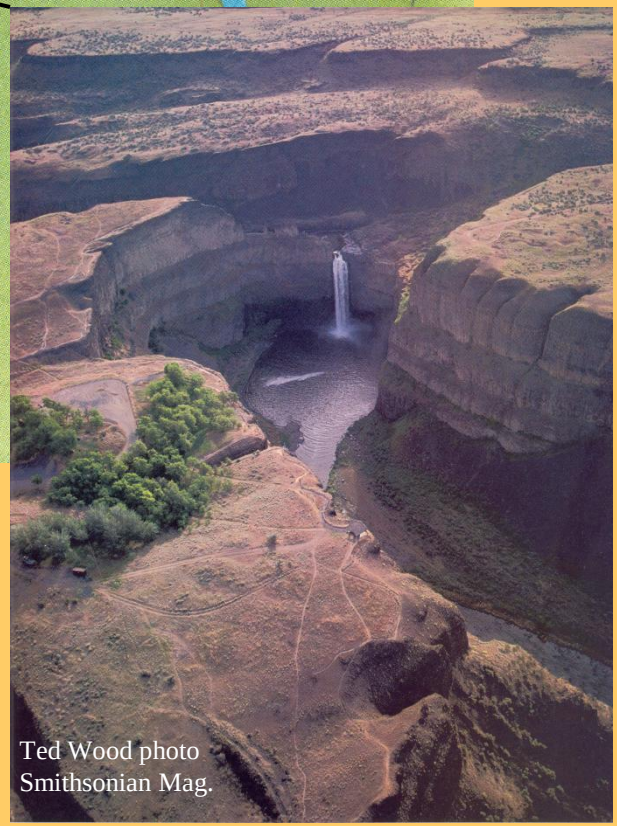
Bretz was puzzled by the size and shape of these features. "An enormous plexus of channels eroded into basalt…" "I could conceive of no geologic process of erosion to make this topography except huge, violent rivers of glacial melt water."





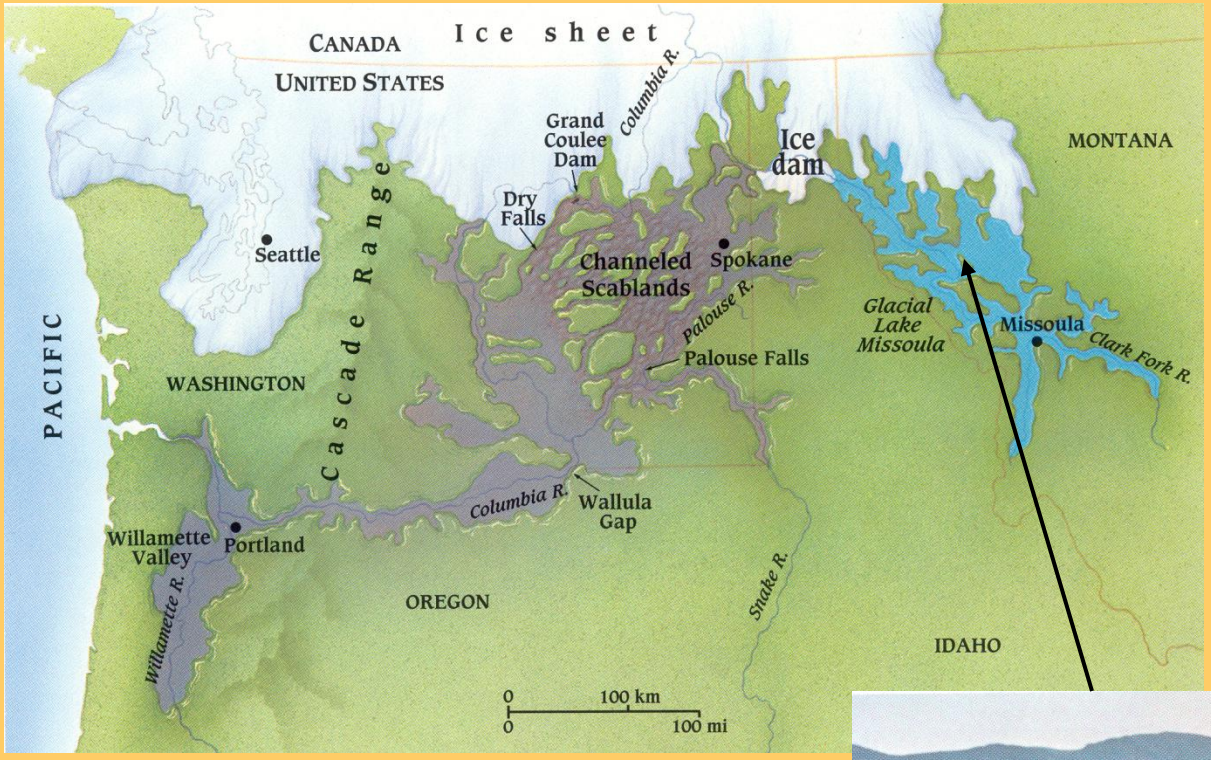
Rampaging with the force of hundreds of Niagara Falls, water gouged this mile-wide hole in Washington's Grand Coulee.





Ted Wood photo
Smithsonian Mag.

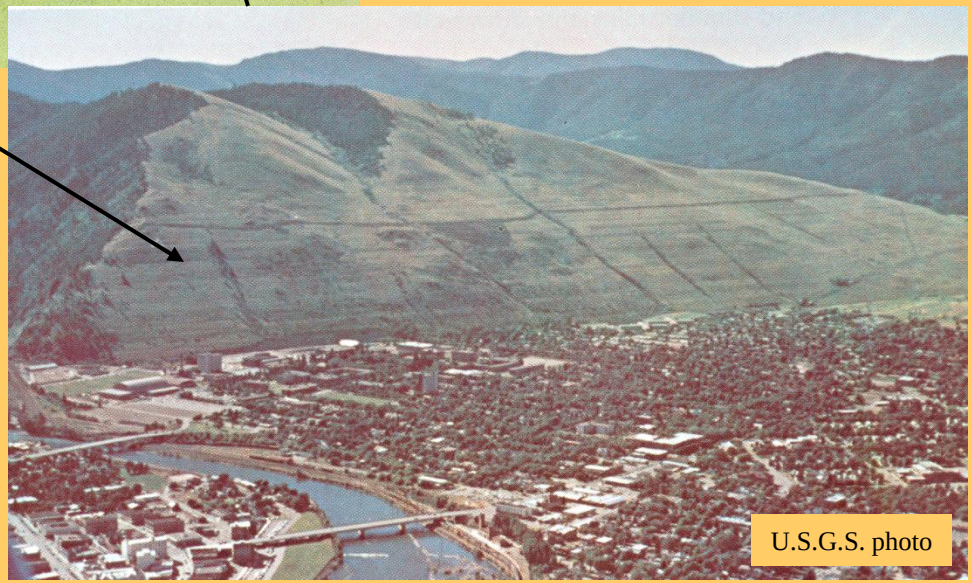
185 foot high Palouse Falls was once a raging torrent during the Missoula Flood.



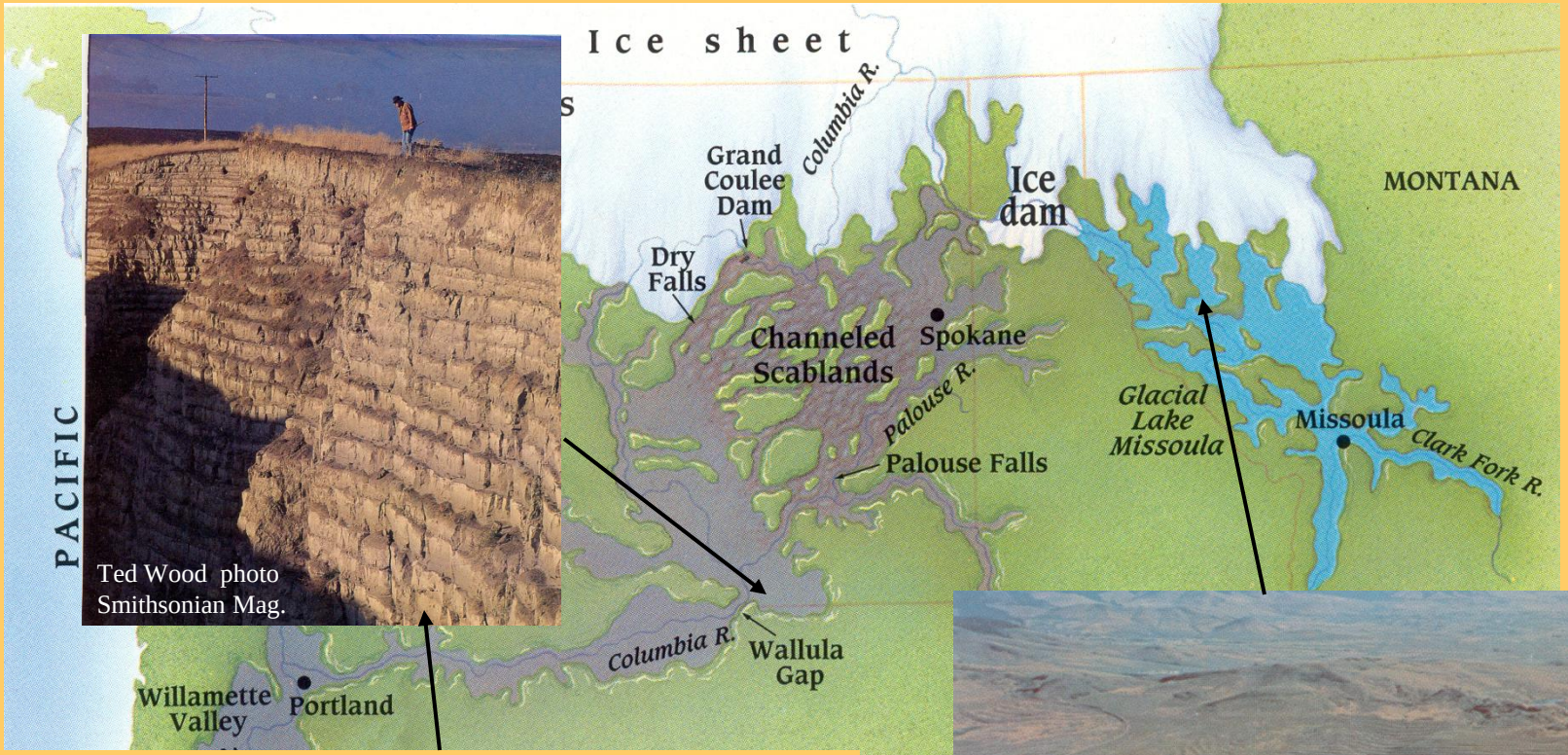
SOURCE OF THE SPOKANE FLOODS

Bretz did not know the source of the floods, but later Joseph T. Pardee, with the U.S. Geological Survey, identified Lake Missoula as the source.

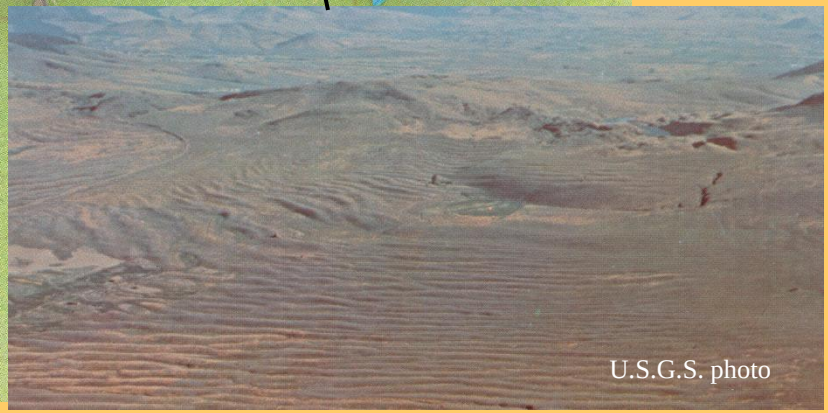
The horizontal lines seen on the slope behind Missoula, Montana represent former shorelines of Lake Missoula, suggesting there may have been more than one flood. The Lake once had a depth of 950 feet and covered an area equal to that of Lakes Erie and Ontario.



U.S.G.S. photo

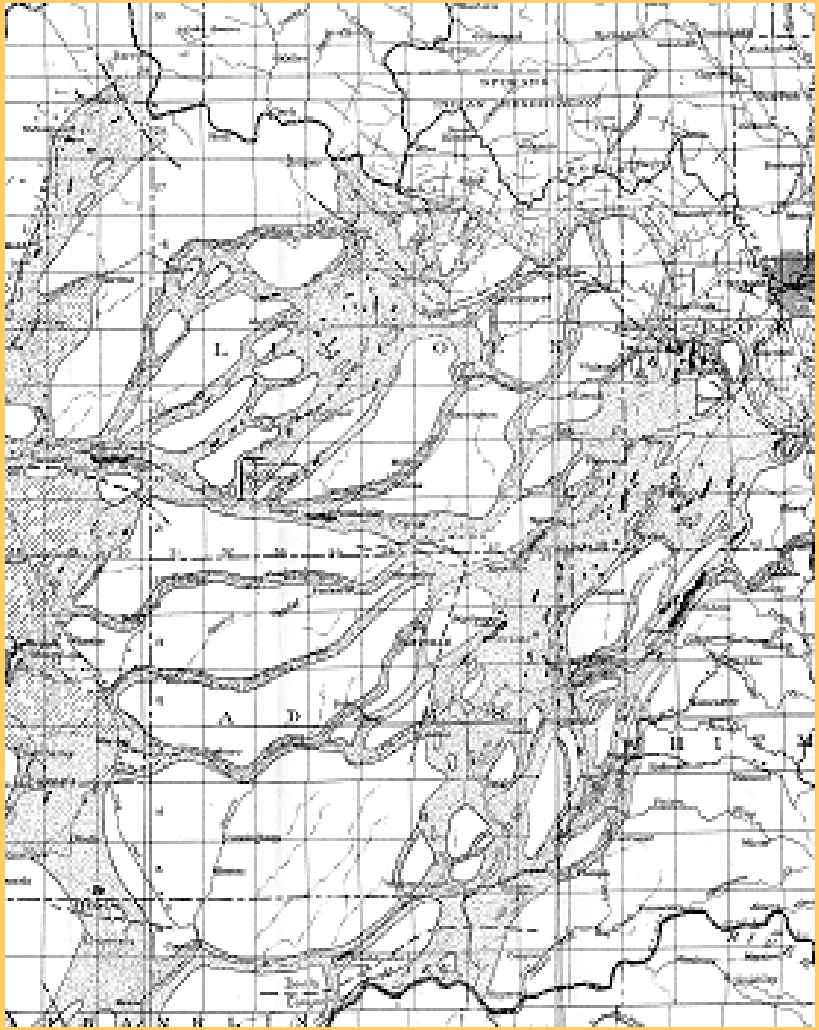


Layers of silt were deposited in temporary lakes as flood waters backed up behind Wallula Gap.

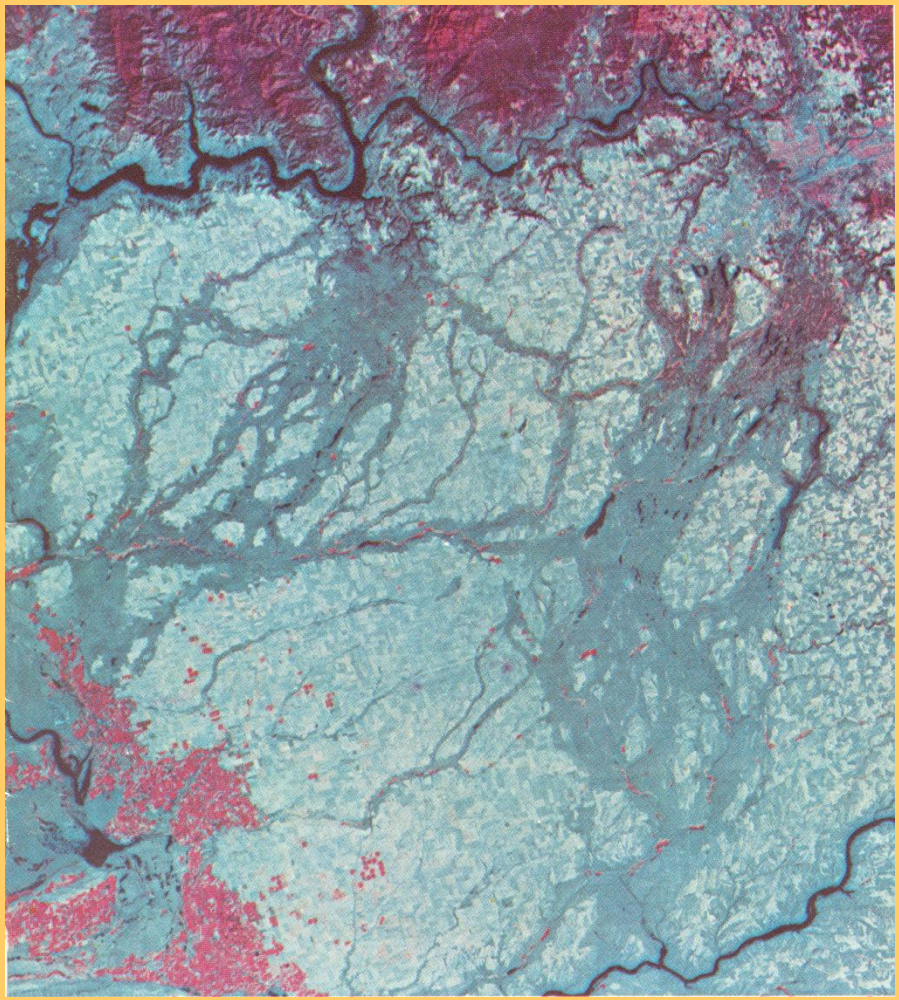


The flood discharge approached 600 million cubic feet of water per second, about 10 times more than the combined discharge of all the rivers in the world. The Mississippi flood of 1993 peaked at 1 million cubic feet per second.

The flood from Lake Missoula created powerful currents reaching 45 mph that created massive ripple marks up to 50 feet high with a wave-length between 200 and 500 feet, formed in sand and gravel, as seen in this aerial view near Camas Hot Springs, Montana.



Bretz's map of the Channeled Scablands published in 1923. *The Channeled Scablands of the Columbia Plateau.* Journal of Geology, Vol. 31, No. 8, Nov.-Dec., 1923.



The NASA Earth Resource Technology Satellite (ERTS-1) covering the Channeled Scablands, August 31, 1972, from an altitude of 569 miles.

THE HYPOTHESIS

"I could conceive of no geologic process of erosion to make this topography [the Channeled Scablands] except huge, violent rivers of glacial melt water." – Bretz.

THE CHALLENGE

In 1927, after three papers had been published on his hypothesis, he was invited to a meeting of the Washington Academy of Science in Washington, D.C., to present his flood hypothesis to a group of highly respected geologists. He was systematically criticized. The flood idea was preposterous said James Gilluly. "Bretz had dug a big hole for himself, out of which he later would be forced to climb." Another renowned glacial geologist of the time, Richard Foster Flint, (a former student of Bretz), a professor at Yale, vehemently challenged Bretz saying that normal streams acting over long periods of time could have done this. Flint's interpretation was later incorporated into textbooks.

VINDICATION AFTER 4 DECADES

In 1965, during a meeting of the International Geological Congress in Seattle, a major field trip to the Channeled Scablands was organized by a group of Bretz's peers, respected Pleistocene geologists. By the conclusion of the trip they were totally convinced that Bretz was right. They gave Bretz their unconditional support. Shortly thereafter the first Landsat images of the Channeled Scablands were released and clearly revealed the flood-channel geometry.

IN 1979 AT THE AGE OF 96 "DOC" BRETZ WAS PRESENTED THE GEOLOGICAL SOCIETY OF AMERICA MOST PRESTIGIOUS AWARD "THE PENROSE MEDAL."

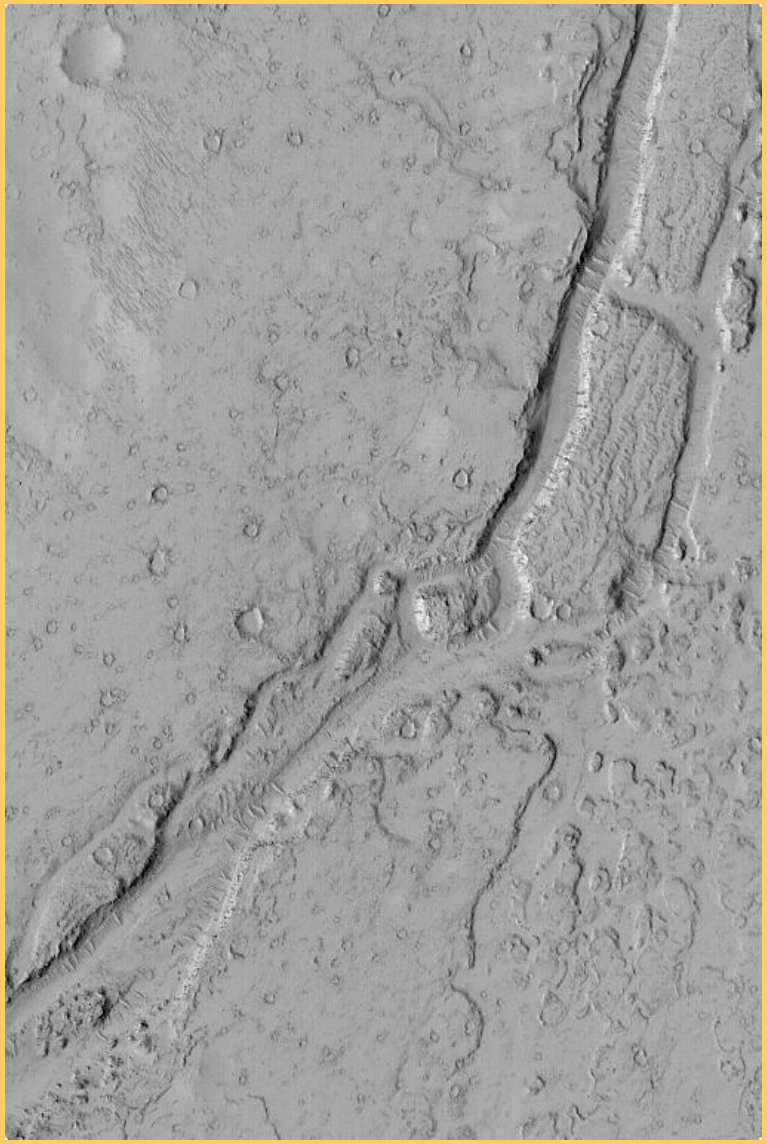
As the Viking spacecraft were orbiting Mars in the summer of 1976, the cameras were trained on the great Martian channel systems. They revealed uplands streamlined by fluid flow, eroded scabland on the channel floor, and many other features that we now know to be diagnostic of bedrock erosion by catastrophic flooding. Fifty years after J Harlen Bretz's theory of scabland erosion on the Columbia Plateau was being denounced at an infamous meeting of the Washington Academy of Science, Viking scientists were using Bretz's well-documented studies of the Channeled Scabland as the major Earth-analog to Martian channel erosion. Few geological concepts, born amid bitter controversy over a half century ago, have continued to have such relevance to our science.

(Quote from nominating letter by Victor R. Baker, Univ. of Arizona, a Bretz authority.)

THE SCABLAND FLOOD CHANNELS
AN EARTH ANALOGUE FOR FEATURES SEEN ON MARS

MARTIAN TOPOGRAPHY OF POSSIBLE FLOOD ORIGIN

Mars Viking image of possible flood channels around cratered uplands near Ares Valles landing site.



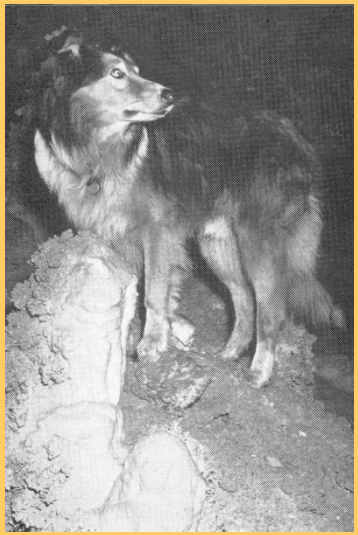
A February 2003 Mars Global Surveyor, Orbiter Camera (MOC2-499c) picture of a valley in the Phlegra Dorsa region of Mars. The valley might have formed by flowing water or lava. The valley is intimately associated with lava flows, and might therefore result from volcanism rather than water. The fluid responsible for the valley moved from the lower left (southwest) toward the upper right (northeast). The picture covers an area 3 km (1.9 mi) wide.

BRETZ RESEARCH

OVER 75 MAJOR PUBLICATIONS COVERING THE FOLLOWING SUBJECTS AMONG OTHERS

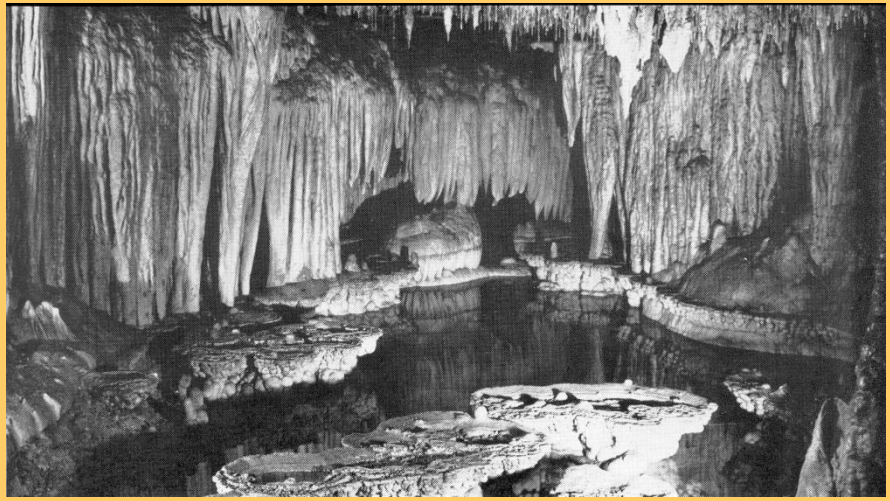
Quaternary Geology of the Puget Sound Region, Washington
Channeled Scablands, Washington
Physiographic Studies in Greenland
Geology of the Chicago region (Draining of Glacial Lake Chicago)
Origin of limestone caverns in 17 states, Mexico and Bermuda
Caves of Missouri
Geomorphic history of the Ozarks

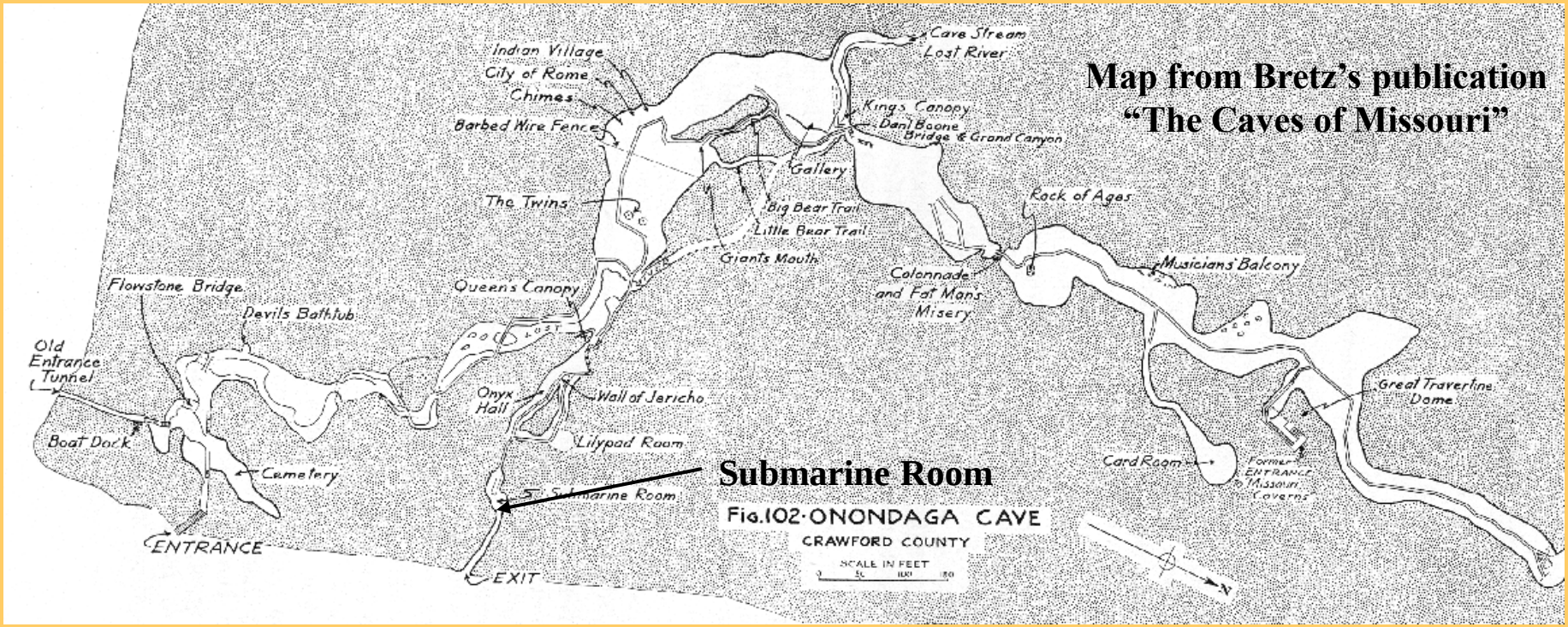
Bretz's collie "Larry" often led the way with a two-cell lantern hanging from his collar.



BRETZ, AN AUTHORITY ON CAVES

Submarine Room, Onondaga Cave, Crawford Co., Missouri.





THE BRETZ CHRONOLOGY

The Albion Connection In Italics.

Born September 2, 1882, Saranac, Michigan.

One of five children, his father a furniture dealer and undertaker and staunch Methodist. He was raised as a Methodist and at one time planned to be a missionary.

Attended Albion College, 1901-05.

Met Fannie Challis, in biology lab first year. Daughter of a missionary to Bulgaria.

Taught biology and physiography 2 years at Flint High school, Michigan.

Married Fannie Challis in 1906. Honeymooned in Seattle.

Taught 4 years at Franklin High School, Seattle.

Ph.D. dissertation, University of Chicago, 1913. Quaternary Geology of Puget Sound region, Washington.

Taught at University of Washington for one year. Then appointed instructor at the University of Chicago, 1914.

Published his first paper on the flood origin of the Channeled Scablands in 1923.

Presented an invited paper on his flood hypothesis to the Washington Academy of Science in Washington D.C. , where he was vehemently challenged by his peers in 1927.

Faculty member of University of Chicago for over 30 years. Retired in 1947.

Neil A. Miner Award for Teaching, National Association of Geology Teachers, 1959.

Field trip to Channeled Scablands by Bretz's peers during International Geological Congress at Seattle brings unconditional support for his flood hypothesis in 1965.

Bretz donates his library to Albion College, valued then at $10,000, in support of the newly founded Geology Department, 1966.

Bretz receives the Albion College Distinguished Alumni Award, 1968.

Bretz Geology Lab at Albion College, dedicated 1971.

Bretz donates his Boulder Strewn rock collection to Albion College, 1975.

Fifty years after Bretz's theory was denounced he is awarded the Penrose Medal by Geological Society of America, 1979.

Recognition by National Park Service and Washington State Park with plaque at Coulee Dam Recreation Center, 1994.

Died February 3, 1981, Homewood, Illinois.

L. D. Taylor photo

Doc Bretz at Homewood, Illinois
September, 1975

BRETZ AT ALBION COLLEGE

Professor C. E. Barr's biology laboratory, Albion College, circa 1904.

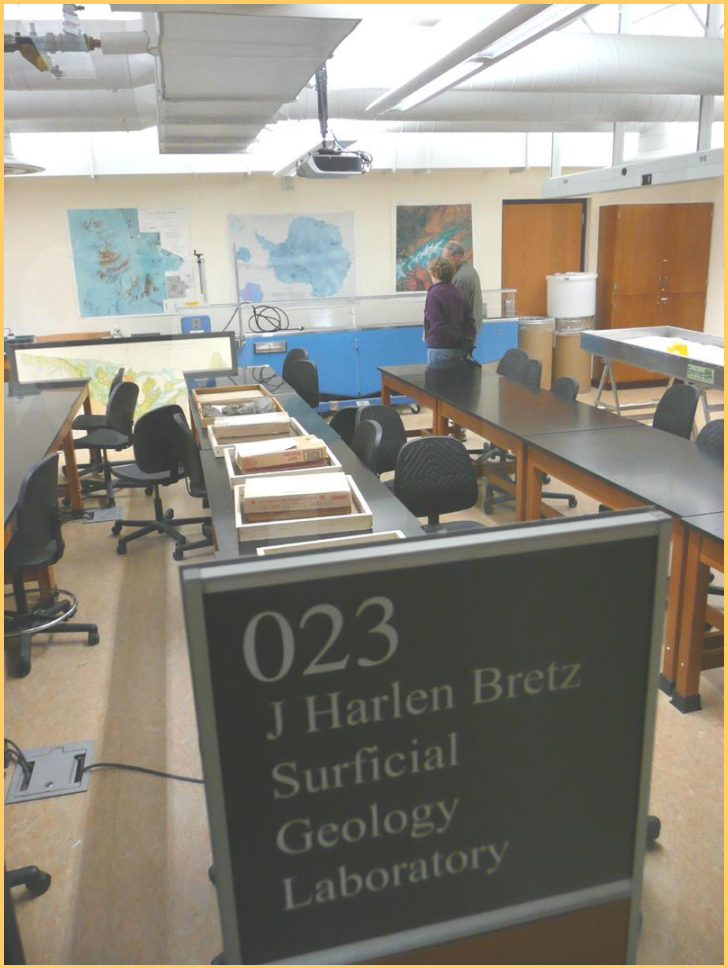
"Albion gave me my start --- especially Professor Barr." - Bretz.

"Bretz, you're going to make a geologist of yourself, aren't you?" - Barr.

THE INFAMOUS SNAKE FEED
From Bretz's unpublished memoirs.

Several of us with unusual interest in biology under Prof. C.E. Barr had extended our interest to the capture alive of local fauna, from amphibia to reptilia to a bald-faced hornet nest, complete with its inhabitants. In particular, Jay Field and I each possessed 2 black snakes and 2 blue racers, through the winter of our senior year, force-feeding them through what should have been their period of hibernation. What to do with them when graduation came? The answer was quickly found. Eat them! What? Eat 24 feet of snake? We solved that problem and gained temporarily undying fame by advertising a Snake Feed. To the 4 snakes we added a snapping turtle (and its eggs), frog legs and water cress salad. All strictly organic. But I found too few frogs, so I added warty toads enough, about a 50-50 chance per diner. We had applications from as many students as 3 inches of snake on the cob per customer could be provided for. Toads were numerous every night in the street under an old-type arc lamp, feasting on insects stunned by the light. This shortage of frog legs was not announced until after the feed. "If your frog leg was of dark meat, it wasn't frog, it was toad". One big football man had preferred the dark meat but, immediately after my announcement, he rushed to the door and left his stomach contents on the lawn.

We had thoughtfully invited the local reporter from one of the Detroit dailys. The headlines next morning proclaimed in big black letters that "Albion College students eat snakes." Many a good Methodist was shocked by this and it earned for us the bitter disapproval of President Dickie.



Surficial Geology Laboratory named in honor of J Harlen Bretz

‘Little sibs” experiment with streams in the J Harlen Bretz Laboratory

BRETZ AND THE PLEIAD

Albion College Pleiad

January 20
1904

Vol. XIX
No. 8

ALBION COLLEGE
LUX FIAT.
ALBION, MICH.

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ALBION COLLEGE PLEIAD

Founded by Class, '86

Published bi-weekly by the students of Albion College.

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BRETZ'S FIRST PUBLICATION

PLEIAD, JANUARY 20, 1904

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THE LEAD ARTICLE

VOL. XIX. JANUARY 20, 1904. No. 8

A GLACIAL RIVER CHANNEL NEAR NEWBERG

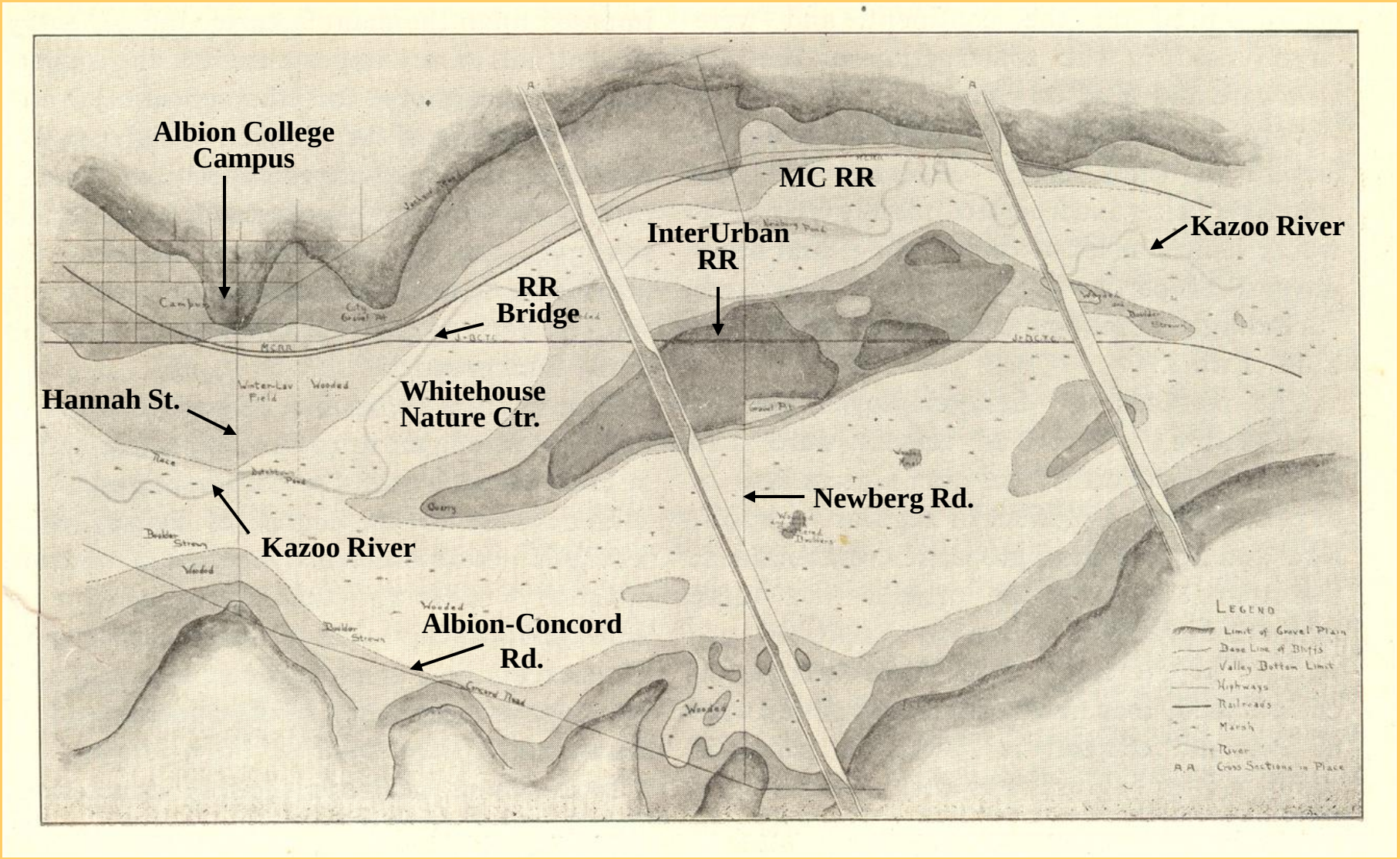
Note.—An article prepared after original research by Mr. Bretz. The writer is to be commended for his work along this line and the PLEIAD would be pleased to have other students show a similar interest in their particular branch of study. EDITOR.

The topography of the vicinity of Albion, geologically considered, is very young as all topography resulting from the great ice invasion of the glacial epoch must be.

A glaciated country is always evidenced by the extreme irregularity of its features and by the character of the subsoil. Pronounced irregularity might be asserted of a surface subjected to ages of erosion, no other geologic

The angle of confluence at the two branches of the Kalamazoo river at Albion is pronouncedly obtuse. Again, Rice Creek, two or three miles north of town flows for ten miles very nearly parallel to the larger stream, the Kalamazoo, which it does not join until it reaches Marshall. This parallel course for any distance can not be found in the older system of drainage.

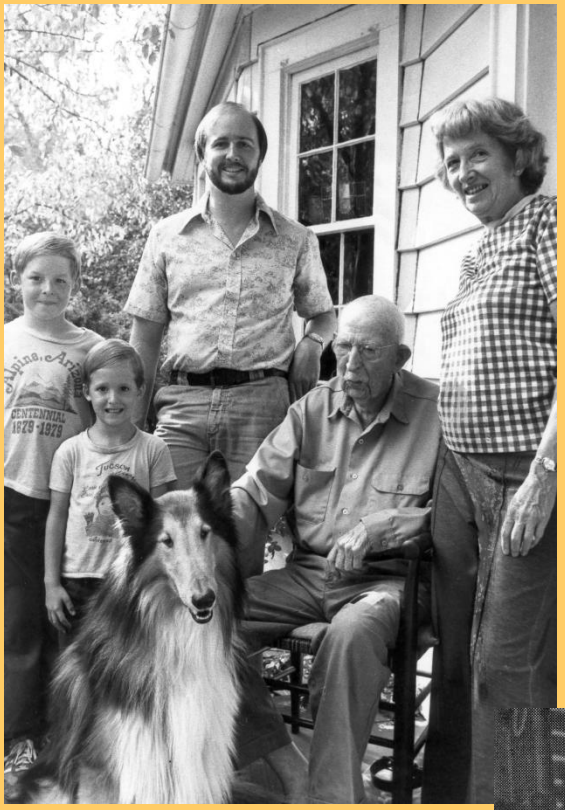
The subsoil of Albion is a heterogenous mass of rock fragments and soil composition derived from almost every kind of bed rock deposit; slate, granite, shale, gneiss, sandstone, quartz, limestone with all their varient formations are found together. No explanation except that of glacial action can satisfactorily account for their indiscriminate as-



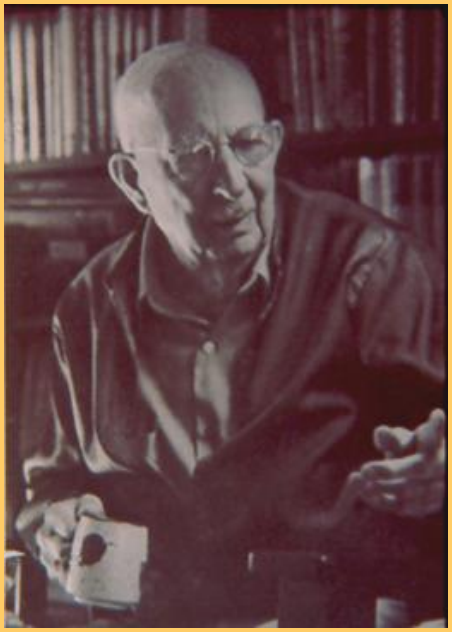
Map showing the glacial flood channel of the north branch of the Kalamazoo River east of Albion.

From Bretz's Pleiad article "*A Glacial River Channel Near Newberg.*"

BRETZ AT HOME



“Doc” Bretz with daughter Rhoda Riley, her son Terry, and her grandsons Todd and Tim. September 1979.



“Doc” Bretz in his study, 1977. “Is that your final answer?”

Fannie Challis Bretz, 1905, preparing wool for the exquisite fabrics she wove.

Bretz’s Penrose Medal.

FANNY

My Fanny girl for 66 happy years, died May 19, 1972, nearly 91 years old. But go through our house and in every room you will see that talented woman recorded in paintings; drapes, cushions, braided, hooked and woven rugs, bed spreads, lamp shades; all products of her industry and love for our home during the last half century. She had several looms and a. spinning wheel, a house full of growing plants and a beautiful garden. She did tie-dying, block printing, china painting, embroidery, dressmaking for herself and Rhoda, copper enameling, crocheting, needlepoint, and bobin lace. She made pressed autumn-leaf Christmas cards that were and are treasured by her friends. She always enjoyed my student and faculty house or garden parties but never wasted her time on bridge parties. Fanny had every womanly virtue, utterly without a flaw. As long as I may live, I shall see with my failing eyesight and in my clear memories, events in our life of empathy. – J Harlen Bretz

1975

1977

OUR GEOLOGY FIELD TRIPS TO VISIT BRETZ, HIS HOME, AND "BOULDER STREWN"

Exploring the basement and hidden wine cellar!

We gathered around "The Boulder", March 1975.

Transporting "THE BOULDER" from "Boulder Strewn", September 1975.

This is the boulder, once part of a sed

That became deeply buried in its original bed,

Came under conditions of metamorphic regimes

And became granitic, by golly it seems.

A billion years old and a dozen or more,

It traveled for miles and miles galore

At a snail-like pace, embedded in ice,

The Pleistocene ice, the Pleistocene ice,

Since accouchement of so ancient a birth

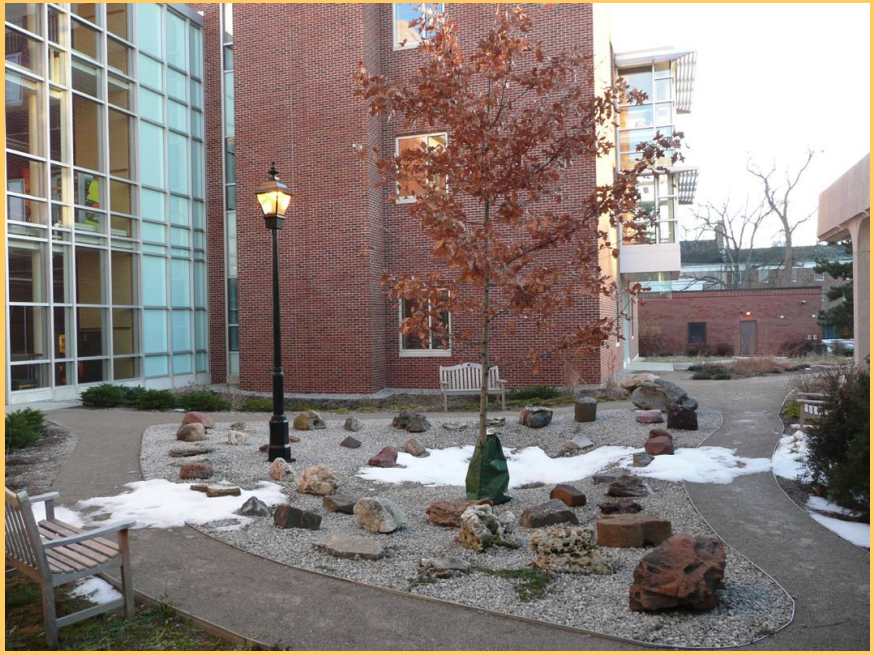
In the Canadian Shield of North America earth.

(It's awful, but the best I can do.)

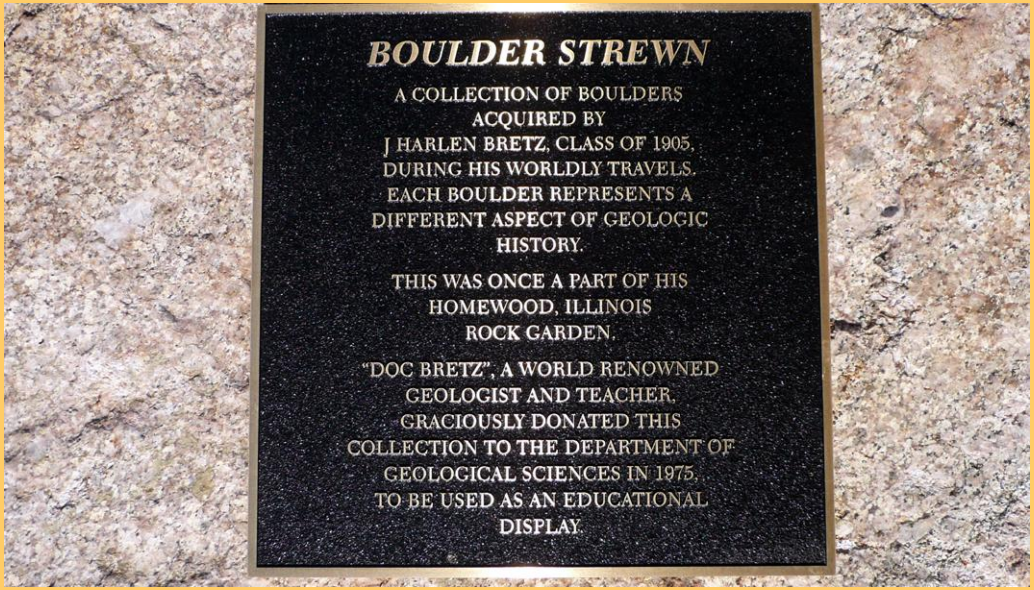
J H. Bretz

Larry Taylor with Bretz boulder on its way to the Science Complex Atrium

From “Boulder Strewn” at Homewood, Illinois to the Science Center Courtyard, Albion College.

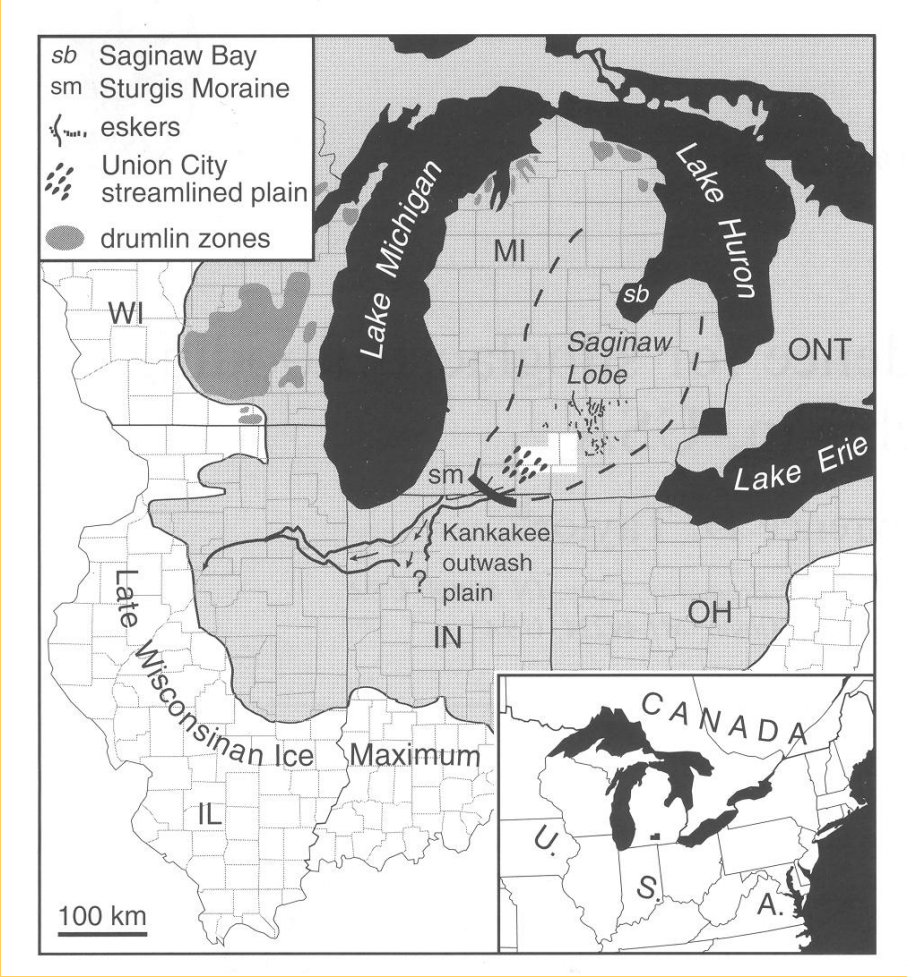


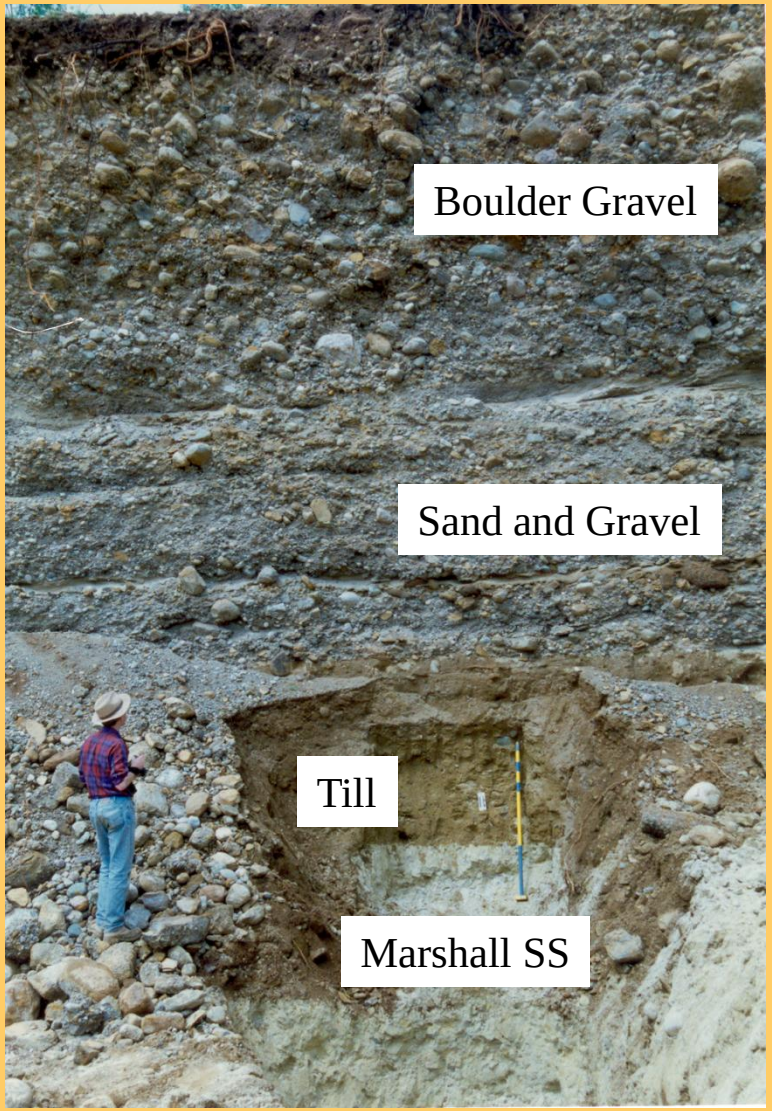
Boulder Strewn restored to new courtyard adjacent to Kresge Hall and Atrium entrance



MORE FLOODS!

Like Bretz, Larry Taylor (a glaciologist who has worked in Antarctica, Greenland, and Alaska) may be generating some divisive theories of his own, as he and a colleague recently have found evidence of ice-age flooding in southern Michigan.





From *Quaternary International*, Vol. 90, 2002, p. 87-115. Sedimentary and Stratigraphic Evidence for Subglacial Flooding, South-central Michigan, USA. Timothy G. Fisher & Lawrence D. Taylor.

1882 - 1981

“Ideas without precedent are generally looked upon with disfavor and men are shocked if their conceptions of an orderly world are challenged.”

SO LONG “DOC BRETZ”

SELECTED REFERENCES

Baker, Victor R., *The Spokane Flood Controversy and the Martian Outflow Channels.* Science, p. 1249-1256, 1978.

Baker, Victor R., *Bretz Wins Penrose Medal.* Nominating letter, Geological Society of America, Quaternary Geologist and Geomorphologist Newsletter, February 1980.

Baker, Victor R. (Ed.), *Catastrophic Flooding: the Origin of the Channeled Scabland.* Benchmark Papers in Geology, v. 55. Dowden, Hutchinson & Ross, Inc. Stroudsburg PA. Distributed by Academic Press, 1981.

Baker, Victor R.; Greeley, Ronald; Komar, Paul D.; Swanson, Donald A.; Waitt, Richard B., Jr., *Columbia and Snake River Plains.* In Geological Society of America, Centennial Special Volume 2, *Geomorphic Systems of North America,* Chp. 11, p. 403-468, 1987.

Bretz, J Harlen, *The Channeled Scablands of the Columbia Plateau.* Journal of Geology, v. 31, p. 617-649, 1923.

Bretz, J Harlen, *The Spokane Flood Beyond the Channeled Scablands.* Journal of Geology, v. 33, p. 97-115, 236-259, 1925.

Bretz, J Harlen, *The Grande Coulee.* American Geographic Society Special Publication 15, 89 p., 1932.

Bretz, J Harlen; Smith, H.T.U.; and Neff, G.E., *Channeled Scabland of Washington – New Data and Interpretations*. Geological Society of America Bulletin, v. 67, p. 957-1049, 1956.

Bretz, J Harlen, *Some Recollections of a Geologist on Entering His 90th Year.* Unpublished Memoirs, Albion College Library Archive Collection, 1972.

Hollinshead, Ann, *Dr. J Harlen Bretz, '05 – Famous Geologist and Cave Man.* Albion College, Io Triumphe, p. 93-96, September 1955.

Parfit, Michael, *The Floods that Carved the West.* Smithsonian Magazine, April 1995.

Thomas, Jennifer, *Marilyn Crandell Schleg, '58, Memorial Lecture.* Stockwell-Mudd Libraries Special Collections Newsletter, Albion College Legacies, Fall 2003.

U. S. Department of Interior, *The Channeled Scablands of Eastern Washington, - The Geologic Story of the Spokane Flood*. U. S. Geological Survey Information Circular 72-2, 1974.

Waitt, Richard B., Jr., *Case for Periodic, Colossal Jokulhlaups from Pleistocene Glacial Lake Missoula.* Geological Society of America Bulletin, v. 96, p. 1271 -1286, 1985.

Welch, Craig, *Natural Wonders: Rock of Ages' Roiling Tale.* The Seattle Times, February 10, 2003.

Websites:

www.nps.gov/iceagefloods

www.iceagefloodinstitute.org