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MEMORIAL OF PAUL DIMITRI KRYNINE

September 19, 1902–September 12, 1964

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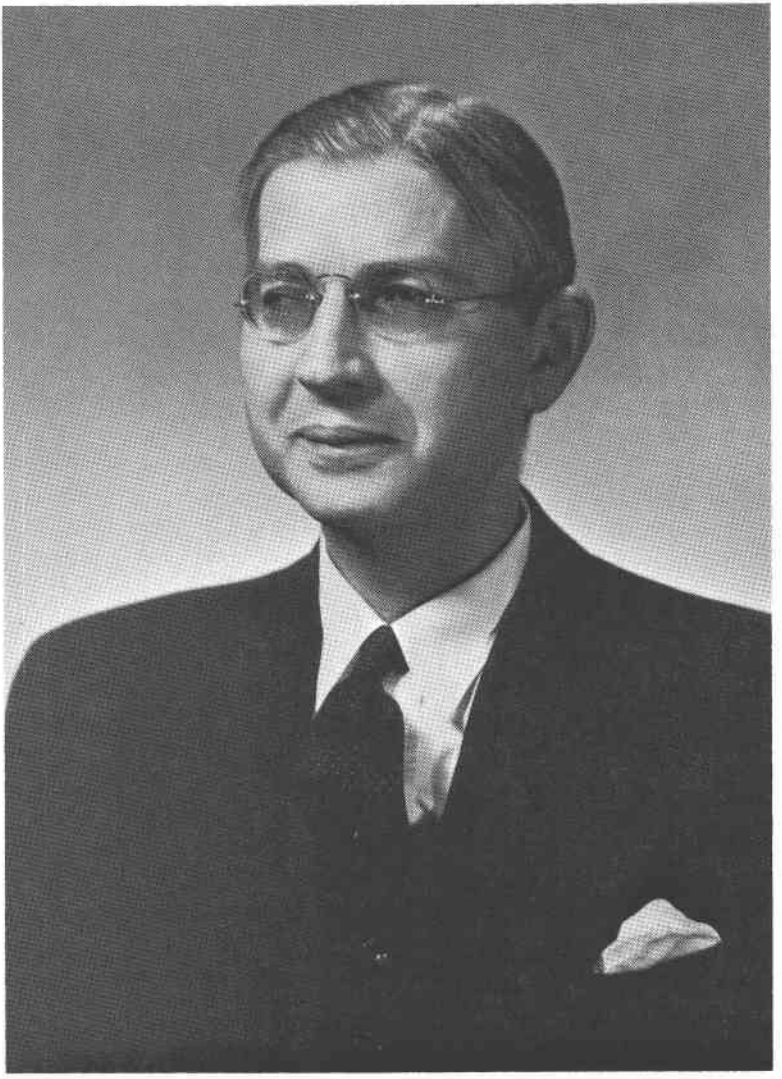
Paul Dimitri Krynine, Professor of Geology and formerly head of the Department of Mineralogy at The Pennsylvania State University died September 12, 1964, of Hodgkins disease. He was born September 19, 1902, of Dimitri P. and Raisa R. Krynine in the town of Krasnoyarsk, Siberia. He spent the first seven years of his life there, while his father, a civil engineer, assisted in the completion of the Trans-Siberian Railroad. In 1909 the family traveled to Buenos Aires where the elder Krynine worked for the Argentine government as a highway engineer. Paul attended a French grammar school and developed, among numerous other scholarly attributes, a proficiency for languages which served him throughout his life. The Krynines returned to Russia in 1917 and Paul completed his schooling in that country with a B.S. in Geology from the University of Moscow in 1924. He then emigrated to the United States and completed another B.A. in Geology at the University of California (1927) before going to work for three years for the Standard Oil Company of California in tropical jungle country of Mexico. It was during this period that his father fled Communist Russia and took a position teaching Soils Engineering at Yale where Paul joined him in 1931 with the purpose of studying sedimentary petrography. Sustained efforts on the part of father and son to get Raisa Krynine out of Russia were unsuccessful, although she was allowed to receive money sent for her support until her death in the 1940's.

At Yale, Krynine was greatly influenced by Adolf Knopf who helped his student develop, in mineralogical and petrographic techniques and interpretation, the exceptional skill of which Paul was justly proud throughout his life. Having just spent three years in Mexico observing processes of sedimentation and arkose formation under humid conditions he found himself in an ideal position to apply his microscopic skills to study the Triassic New Haven arkose and to use his results to forward the concept that arkoses and red beds could be formed not only where dry or cold climates slowed the rate of weathering but also where erosion was sufficiently rapid and burial sufficiently prompt to inhibit or prevent weathering. As pointed out in "A Portrait of Paul D. Krynine" (Folk and Ferm, 1966) his dissertation on the "Petrology, stratigraphy, and origin of the Triassic Sedimentary Rocks of Connecticut" (1936) "remains a classic in the field of sedimentary petrography, in paleoclimatology, and in the red bed controversy. As much as any other, this paper is typical of Krynine at his best—careful assembly of data, often from diverse sources drawn together in an exciting and controversial style, all directed toward support of his argument on a controversial issue." It is tempting to think that had this contribution been published at the time of its completion, the development of the field of sedimentary petrography would have been facilitated and, more particularly, Krynine's relationships with his colleagues in the field might have been more effectively channeled toward their mutual goals. But, because of the depression and World War II, the Connecticut Geological Survey could not issue the publication for fourteen years (1950) leaving Krynine in the unenviable (though not unchallenging nor, to him, unwelcome) position of justifying some of his concepts without recourse to the only comprehensive compilation of all the evidence. To Paul Krynine, a man who gave the appearance of having supreme self-confidence, his word—with or without evidence—should have been enough; but such a position rarely makes converts of fellow scientists, and the abstracts which poured out in the fourteen year interval may have tickled the palates but did not assuage the appetites of his colleagues.

But during these fourteen years, and thereafter, until his death, Paul D. Krynine did make frequent and outstanding scientific contributions which, when put forth in print, in classroom, and in lecture-hall—via the theatrical mechanics and acidic remarks for which he was noted—exacerbated controversy yet accelerated the progress and increased the importance of sedimentary petrography. Paul was a showman but he had worthwhile things to show; and the minority of students and his fellows who rejected the wares from offense at the sales-pitch, were the losers.

In leaving Yale to become an instructor at Penn State in 1937 Krynine



Paul Dimitri Krynine

rapidly adapted to an environment of limestones, dolomites, graywackes, quartzites, and oil sands of northwestern Pennsylvania. His association with A. P. Honess—Professor of Mineralogy, master teacher, crystallographer, mineralogist and petrologist, and a perfectionist in the knowledge and use of optical techniques—further convinced Krynine that most geological problems of any significance could be solved with a few thin sections and a well trained, skilled observer, with a petrographic microscope tube in-between. The famed Bowenism, "give me one thin section and I'll tell you the history of the Black Hills" became the Kryninism "give me one thin section and I'll give you the story of the Appalachian geosyncline."

Not that other techniques were, by any means, rejected. Thus, he was an enthusiastic supporter and promoter of clay mineralogy as the expanded use of X-ray diffraction, differential thermal analysis, and electron microscopy resulted in the development of this field at Penn State. But in his eyes, these tools were primarily useful supplements to the more powerful and versatile "light" microscope. And, as if to prove his point, one of the co-authors will never forget that the direction of his thesis study on the origin of a clay mineral deposit was changed almost overnight (and, incidentally, a year was added in getting the doctorate) as the result of P. D. K.'s critical microscopic scrutiny of a few thin sections and the resulting observation that it might be interesting to study the inclusions and patterns of bubbles in the few quartz grains embedded in the clay before finally concluding—on the basis of two years of arduous field and laboratory study—that the deposit was residual rather than transported. It was transported!

At Penn State, Krynine, following the lead set by Honess (1930), engaged in the study of oil reservoir rocks and commenced his comprehensive studies of the Appalachian geosynclinal sediments. Short, titillating articles on the Oriskany (1941), the petrographic aspects of reservoir behavior (1949), and an early version of his main theme relating tectonics to sedimentation (1943) represent his evolving ideas on geosynclinal sedimentation. The capstone of this series is again a monograph, this time on the Third Bradford Sand (1940), which completed one of the most thorough petrographic analyses ever performed on a detrital sediment which was also a major oil reservoir rock. Two of Krynine's four detrital rock types, the arkose and low rank graywacke, are now enshrined in the literature; the article on the Oriskany represented a third (quartzite), but a detailed monograph on this group was never completed.

The fourth rock-type, the high rank graywackes, are an enigmatic group and did not receive detailed treatment until Krynine completed the petrography of some sediments from the Arctic Slope of Alaska

(1951). These four rock types form the basis of the Krynine classification (1948) which is still the only operationally sound, systematic classification of the detrital sediments.

Perhaps the main contribution which emerged from his petrographic analysis was a synthesis of petrological dialectic in which diastrophism was tied to sedimentation in a comprehensive "gestalt" of the origin of the detrital sediments. This comprehensive theory was never published in detail and only brief outlines are recorded (1942, Chile, 1943; 1950, Review; 1951, A Critique, etc.).

As suggested heretofore, Paul D. Krynine, was a superb teacher. He excelled in the art of pedagogy; and like any true artist the methods were unique to the man. His audiences, whether of colleagues, students, or social acquaintances, may not have agreed with his statements nor enjoyed the way he put them across; but most would agree that the thought was effectively transferred and firmly affixed for future reference, and that the learning process had been strengthened. This is not the place for a discourse on pedagogical techniques, and for a candid account of Krynine's *modus operandi* the reader is referred to the "portrait" by Folk and Ferm (1966). Suffice it to say here that his upbringing made him a strict disciplinarian (some students would say "tyrant") in *his* classroom while his love for attention made him, in contrast, the most cantankerous "student" when he sat in the audience of a speaker with whom he did not agree, or when he simply wanted his presence to be known. He was excellent in teaching students not what the answers might be but how to look for them; not only what to learn but how to learn, starting with the problem of asking "answerable" questions. He had a knack for teaching by analogy and using simple metaphors to get a point across: "You can't get blood out of a turnip" or "no cooking on a cold stove."

He was particularly effective in the undergraduate laboratory where any unusually apt, or particularly inept, diagnosis by a student resulted in an impromptu lecture for the group illustrated with the rapid scrawl of colored chalk and punctuated with appropriately tart remarks of wonder at how student so-and-so could possibly be so stupid or, conversely, could surprisingly have suddenly gotten so smart. Yet he was patient in the extreme with any hard-working student who in his opinion had enough brain power (apparent or on record) to be considered worth the effort; and he took pride in and gave praise to those who, in the short or long run, showed good progress as the result of his tutelage.

With his graduate students he was like a strict father to his children. They were there to be patiently schooled and disciplined in the rigors of the scientific method; to be impressed with power of a keen sight and a sharp mind over the complexities of nature in general and sedimentary

rocks in particular; to be molded into men ultimately (perhaps) deserving of membership in an extremely exclusive society of sedimentary petrographers recognized as such by P. D. Krynine; and to be occasionally but only very occasionally spoiled. He spent long hours with them over their thin sections taking apart their observations and interpretations, and helping them to glimpse more acceptable results which might be forthcoming in return for continued arduous labors. Depending, then, upon his own estimate of how long these labors should take the student in question, he might let them "stew in their own juice" for months or bring them up sharp for another session when, by his time-table, they should have been (but were often not) ready. Among associated students and staff, all were wholeheartedly agreed that Krynine's Ph.D.'s really earned their degrees, though there was controversy among the short-sighted as to whether it was really worth it.

Finally, there are some important words missing thus far in the description of Paul Krynine that have been omitted only because of the way this memorial has been structured. Included among them are *kindly*, *loving*, *considerate*, *generous*, and *courageous*. Those of us on the Penn State staff who had the opportunity of working with him at close quarters over the years experienced the constancy of these wonderfully warm and human characteristics. Though his self-confidence seldom if ever faltered, Paul's armor of egotism and professionalism had many chinks. As a department head he was thoughtful and not demanding, ready with good advice whenever sought, and respectful of the rights of his subordinates. His time was ever available for conference or question; and indeed he not infrequently caused some embarrassment by preemptorily ejecting the "lowly" student at his side to give priority to a colleague who had simply stuck his head in the door to get an opinion or relay some information.

He deeply loved his wife, the former Josephine Doyle of Chicago, whom he married in 1933, and his son Peter, born in 1944. His father, who outlived Paul by several years, came to State College from California each year to share in the family Christmas, and the source of P. D.'s "old school" charisma was evident in these family occasions.

Paul D. Krynine, like many other members of the geological fraternity, was an interesting and controversial figure. There is no controversy, however, over the fact that he played a key role in the modern development of the science of sedimentary petrography, and succeeded in giving his University an international reputation in that field. One can ask little more of a scientist and professor.

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MEMORIAL OF FELIX KARL LUDWIG MACHATSCHKI

September 22, 1895–February 17, 1970

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Felix Karl Ludwig Machatschki was born in Arnfels, Styria, Austria. During his studies at the University of Graz and some years of assistantship with R. Scharizer at the same university, he received a very good training in classical mineralogy and petrography, and a thorough acquaintance with the methods of mineral and rock analysis.