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Memorial of F. Donald Bloss 1920–2020

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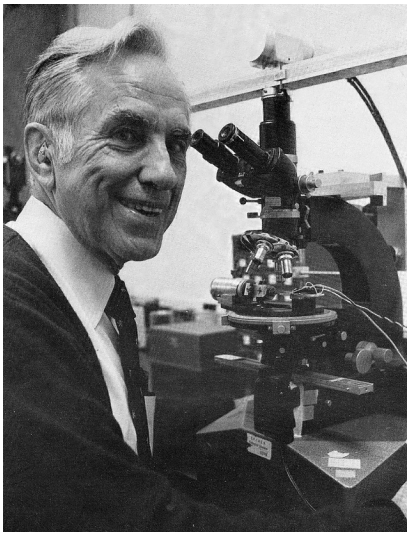
May 30, 2020: As I compose this memorial to one of the giants in our field, today would have been the century mark for F. Donald (Don) Bloss. Sadly, Don passed away April 22, 2020, in Blacksburg, Virginia. Don died peacefully in his sleep of age-related health issues, his wife of 74 years and his youngest daughter by his side. Don is survived by his wife Louise and three daughters, Terry, Janet, and Jill. He was preceded in death by one son, Donald Bloss, who sadly died at the too-young age of three.

Don was born and educated in Chicago, receiving his BS ('47) and MS ('49) in Geology and Ph.D. ('51) in Mineralogy from the University of Chicago. Don had started at the University in 1939 as an English major who was also on the football team. He changed his major to geology after taking a required science elective from J Harlen Bretz of Channeled Scablands fame; also as the university dropped its football program. And like many current college students he had a gap year, well several, as he was called away like many of his generation (i.e., the Greatest Generation) to serve in World War II—more on this later. After completing his Ph.D. Don accepted a faculty position at the University of Tennessee in 1951, leaving there in 1957 for Southern Illinois University. He finally left SIU in 1967 for VPI, now better known as Virginia Tech, where he would spend the rest of his career. He ultimately became the first Alumni Distinguished Professor in 1972 and then Emeritus in 1991.

Don is best known to the mineralogical world by his textbooks, but he was also a dedicated family man, both personally and professionally. Of course, there was also the wit! The integration of books, family, and wit is seen in his book dedications. His first book *An Introduction to the Methods of Optical Crystallography* (1961) was dedicated to his wife Louise, as was the second edition *Optical Crystallography* (1999). His second book *Crystallography and Crystal Chemistry* (1971) was dedicated "To my daughters, Terry, Janet, and Jill, in order of appearance." His final scientific book was *The Spindle Stage: Principles and Practice* (1981) and is dedicated to "$Mn_9(SiO_4)_4(OH)_2$ (aka "Chips")." There's really a name where the chemical formula is of a gentleman who was one of Don's first graduate students, who also served on the USS Missouri as a carpenter (thus the "Chips").

His last book *WWII, Mineralogy, and Me: A Memoir* (2012) was "For my students (who often taught me)." The memoir contains more words than his optical crystallography book and was heavily influenced by one of Don's favorite authors and storytellers—Mark Twain. It's available on the MSA website, as are all of Don's aforementioned books. It is worth reading, as it gives a sense of a different time, while learning both American history (e.g., there's a section titled "Cuddling up to the atomic bomb"), early geology theories [e.g., the section on "J (no period) Harlen Bretz"], and mineralogy (e.g., the "Blacksburg Mafia"). Needless to say, these titles also give more hints as to his wit. On a more serious note, he also discusses his role in a medical military unit stationed in England during WWII as a conscientious objector.



Don sitting at the spindle-stage equipped PLM in his Virginia Tech lab, circa the mid-1980s.

Most would not guess that Don's first research publication in 1949 dealt with Yellowstone geysers (Bloss and Barth 1949). Yes, we geologists were a bit more diverse in our research back then! Also, most geologists are taught that quartz does not have cleavage, but perhaps they should read Bloss and Gibbs (1963) to find that not to be the case. There is also an interesting story with that publication that Don once told me; the only equipment they had was a polarizing light microscope (PLM) equipped with a U-stage, a mortar, and a pestle. So, they broke quartz grains and measured their *c*-axis inclinations.

Don's major research accomplishments really started when he begun refining and developing new methods for collection of optical data with a spindle-stage-equipped PLM. These efforts revolved (pun intended) around the spindle stage—a one axis rotation device that mounts on a PLM with its rotation axis perpendicular to the light path. One of the first accomplishments was to develop computational methods to orient a biaxial crystal based on simple measurements (Bloss and Riess 1973). He continued this work culminating in the computer program EXCALIBR and applications described in his MSA Presidential Address (Bloss 1978). This was followed shortly by a textbook describing these newer, refined spindle stage methods (Bloss 1981).

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A series of research projects by Bloss, his students and post-docs used these methods to clarify earlier issues on mineral optics or to make new discoveries. Selkregg and Bloss (1980) showed how the distortion index in cordierites was not related to Al/Si ordering, but to composition. Gunter and Bloss (1982) showed how the optical orientation of andalusite changed with Fe and Mn content resulting in a biaxial mineral appearing isotropic; this explained the reason for a gap in the solid solution of andalusite to kanonaite, and quickly resulted in andalusites of that composition being found in nature. Armbruster and Bloss (1982) showed how precise measurement of the optical properties of cordierite could be used to determine the orientations of H_2O and CO_2 in the cordierite channels. Su et al. (1984, 1986) showed how precise determination of $2V$ could be used to ascertain the structural state of feldspars. As computer systems and codes evolved, the EXCALIBR program did as well, first by being ported from mainframes to desktops (Gunter et al. 1988), then being rewritten in C—it was originally in FORTRAN (Bartelmehs et al. 1992). EXCALIBR was refined and modified to produce stereographic plots of the results (Gunter et al. 2004, 2005).

Our small group has continued to use these methods in our research to show how useful optical mineralogy and the orientation dependent properties of minerals are. Palmer and Gunter (2000) showed how the H-content of cation-exchanged zeolites could be indirectly determined by optical properties. Gunter and Twamley (2001) used the spindle stage in conjunction with a single crystal diffractometer to directly determine the optical orientations of minerals. Bandli and Gunter (2001) used the spindle stage in combination with an SEM to show the morphology of amphiboles in different orientations and aid in mineral identification by combined EDS-determined composition and optical properties. Dyar et al. (2002) used the spindle stage to show how XANES spectra vary as a function of mineral orientation in much the same way as optical properties. Finally, Steven and Gunter (2017, 2020) have rewritten EXCALIBR in Excel calling the new program Excelibr. Their new program also aids in determining the optical orientation based solely on PLM spindle stage measurements. For the above mineralogical research, the mineral blossite was named in his honor in 1987. Two other mineral names, jerrygibbiste and ribbeite, will remind us of Don's close colleagues at Tech (i.e., Jerry Gibbs and Paul Ribbe). That trilogy of professors, their students, and post-docs are what Don lovingly called the "Blacksburg Mafia."

Don served MSA in many capacities, becoming a member in 1950, and was made a Fellow four short years later. He was also an MSA Councilor (1968–1970), Vice President (1976), President (1977), and Past President (1978). He was one of only two individuals to serve as MSA President and Editor of the American Mineralogist (1972–1975). Finally, I am confident that if Don had lived to the century mark, all he would have wanted for his birthday would be for the mineralogists, petrologists, and geologists of the world to not forget the value of the use of the PLM in teaching and research as discussed herein! Of course, he might also want you to appreciate the meaning of a title that was rejected by an editor from one of his publications on the optical properties of biotite—Biotite: 2V or not 2V.

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