The Sciences at Black Mountain College
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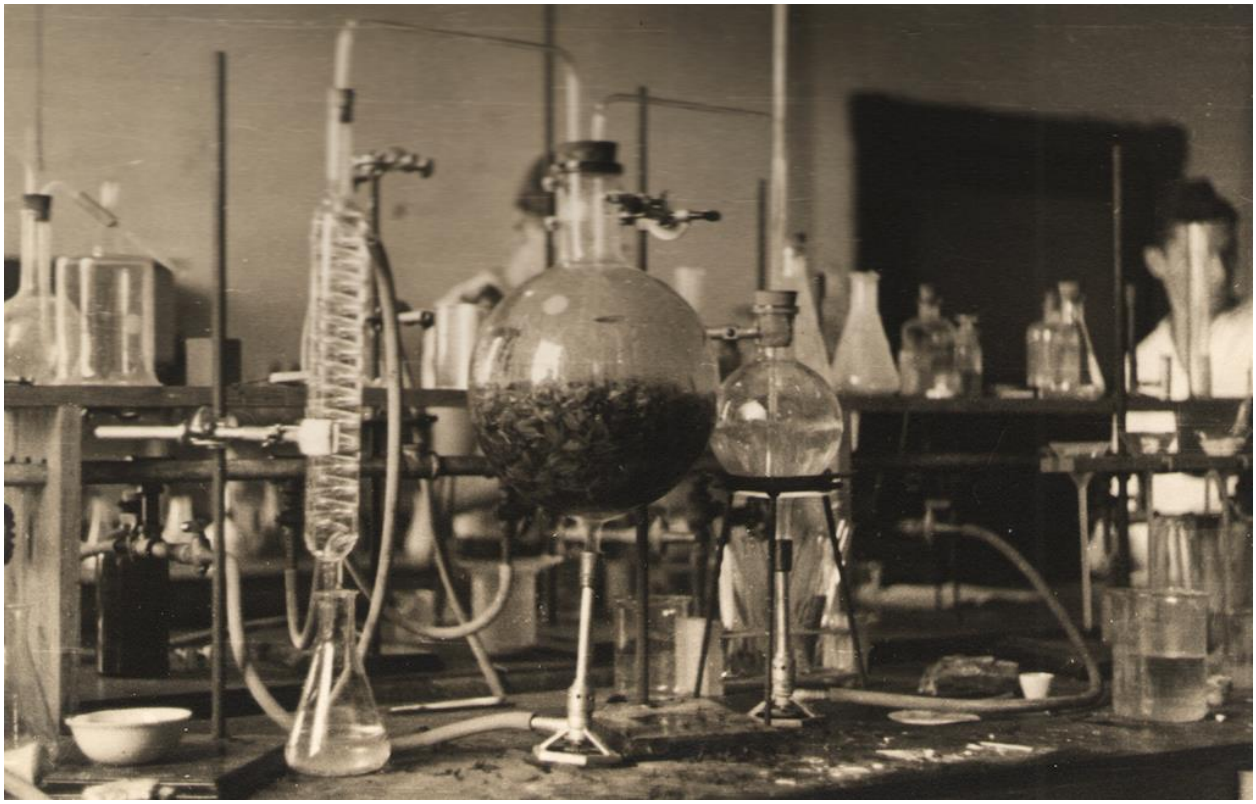

Figure 1. Kenelm Winslow, *Black Mountain College Chemistry Lab*, late 1930s - early 1940s. Vintage gelatin silver print. Collection of Black Mountain College Museum + Arts Center. Gift of Kenelm Winslow, Jr.

I. Introduction

The reputation of Black Mountain College (BMC) stems to a great extent from the role it has played in the history of modern and contemporary art. Much of the literature about BMC focuses on the arts. The college founders did believe that the practices of art should play a central role in education. However, at its philosophical core, BMC was a liberal arts college committed to having a full curriculum of courses in the arts and sciences. The importance of the sciences is stressed in the first BMC Catalog. It states that, “It is expected” that students in the Junior Division “will have acquired an attitude

towards Science, Social Science, Literature and the Arts that is based upon knowledge rather than ignorance." (BMC Records: General Files 1933-1956) This commitment to a broad education, including the sciences, is supported throughout the college's history.

While BMC has received much attention for its artists—many of whom were at the college only during the Summer Arts Institutes—BMC also attracted several faculty members in the natural sciences who taught in the liberal arts curriculum, and who made significant contributions in their fields during and after their time at BMC. This article provides a brief history of eight of the science faculty who taught at Black Mountain College. By looking at these individuals, one can gain some understanding of how the sciences fit into the curriculum and culture of BMC. These scientists represent only a limited sample, selected because they taught during the regular academic year and taught primarily in the core sciences.

The second section of this paper provides some background on how the sciences played a role in the foundation and roots of the BMC curriculum. Two of the founding members of BMC, Frederick Georgia and Theodore Dreier, had been science faculty at Rollins College. Both have been extensively covered in several histories of BMC. Therefore, this article will focus primarily on their connections to the sciences at BMC. Neither was a leading scientist, compared to the other six individuals discussed. The significance is that they brought from their shared experience at Rollins a deep commitment to liberal education and an understanding of the importance of the sciences in the academic program. Georgia's work at Rollins helped craft a view of liberal education that significantly shaped the BMC curriculum. This view included a respect for both the arts and sciences. As a member of the faculty for 16 years, Dreier's influence on the role of the sciences at BMC cannot be understated.

The third section of this paper provides an introduction to six prominent scientists who taught at BMC over the short 23-year life of the College. Each has left a significant impact on their scientific discipline. Erwin Straus, a neurologist and psychiatrist, who had been a professor in the Medical Faculty of the University of Berlin, was a member of the faculty at BMC from 1938 to 1946. In the early 1940's, two of Albert Einstein's post-doctoral assistants joined the BMC faculty. Both Nathan Rosen and Peter Bergmann were employed at BMC for one year at the beginning of noted careers in

physics. Several prestigious refugee scientists found their way to BMC. Fritz Hansgirg, a chemist who did research on mass production of high purity magnesium, worked at BMC from 1942 until 1949. Max Dehn, a German mathematician, who did foundational work in topology and group theory, taught at BMC from 1945 until 1952. Natasha Goldowski Renner, a chemist who was an expert on the corrosion of metals and had worked on the Manhattan Project, was a faculty member at BMC from 1947 until 1953.

To date there has been little research concentrating on the scientists at BMC and their contributions to the legacy of the college. However, the scientists have not been ignored either. Books about the history of the college include anecdotes and details about the scientific activity on the campus. Much of the general information about BMC in this article has come from the historical texts by Martin Duberman (1972) and Mary Emma Harris (1987). Both of these authors did extensive research and personal interviews with many of the faculty and alumni from the college. Each has donated their collections of notes and interviews to the Western Regional Archives in Asheville, North Carolina. These have been a great source of information.

II. The Roots of the Sciences in the BMC Curriculum

Rollins College, in Winter Park, Florida, began a progressive education experiment in 1925, when the college hired a new president. Within a year of starting at Rollins, President Hamilton Holt had implemented his “conference plan.” This approach emphasized one-on-one interaction between students and faculty. As opposed to lecturing, faculty served as mentors to guide students. Holt realized that this required a uniquely qualified professor. He began hiring his “golden personalities,” faculty distinguished in their discipline and dedicated to teaching, who could champion his new approach to liberal education. The four founding members of the BMC faculty were hired by Holt to teach at Rollins College during these years. By 1930, Holt had the whole Rollins campus community planning for an extensive reworking of the curriculum based on modern theories of progressive liberal education. To culminate this work, he held a national conference at Rollins in January 1931. Holt invited the philosopher John Dewey to chair the proceedings. The aim of the conference was to bring together leading experts on liberal education to envision a cohesive structure to the college

curriculum in America. The conference, “The Curriculum for the Liberal Arts College,” resulted in an important report (Dewey 1931) that has served as a guide for many progressive liberal arts colleges since that time.

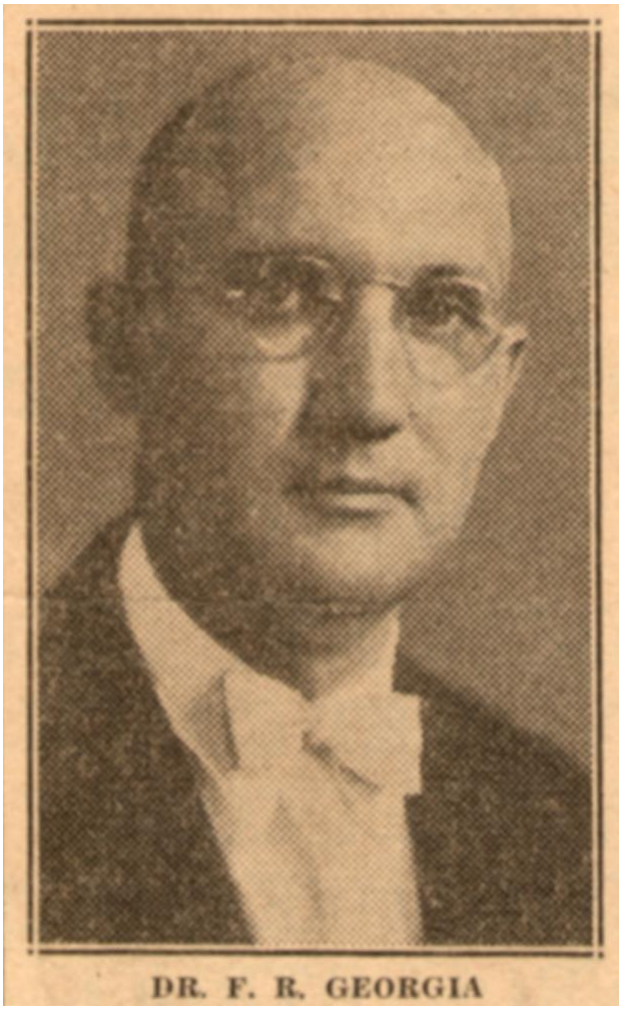

Figure 2. Photographer unknown, *Dr. F. R. Georgia*, "Plans And Purposes Of New College Explained," Asheville Citizen, Sept. 23, 1933. Collection of Black Mountain College Museum + Arts Center. Gift of Pack Memorial Library.

Frederick Raymond Georgia (1892-1961) was hired at Rollins as one of President Holt's golden personalities. According to records at the Rollins College Archives, Georgia earned a bachelor’s degree in 1915 and his PhD in 1922 at Cornell University working in Chemistry. From 1915 until 1926, aside from serving 14 months in France as a First Lieutenant in World War I, he was a lecturer at Cornell University where he taught and published research in Sanitary Chemistry. In 1926, he joined the faculty at Rollins College as the head of Chemistry. A Rollins announcement stated that Georgia's hire indicated President Holt's intention “that science ... is to receive proper emphasis in the liberal arts curriculum of Rollins College...” (Rollins 1926) In his position at Rollins, Georgia was given a leadership role in determining the college's new curriculum. From 1930 until 1932, Georgia served as the chair of the college curriculum committee. This was an important position as the college was preparing to transform its academic program. The curriculum committee produced a preliminary report in 1930 and then the next year presented a comprehensive “plan for the organization of the curriculum of the College.” (Dewey 1931)

The 1931 Rollins College Curriculum Committee Report (Dewey 1931) outlined several ideas that would find their way into the BMC program. The curriculum was divided into a Lower and Upper Division. (At BMC these were called the Junior and Senior Divisions.) The Lower Division was intended to provide students with a “broad foundation,” while in the Upper Division students acquired “effective mastery of a field.” In the Lower Division, students were expected to gain competence and knowledge in several areas. This included: English, foreign language, mathematics, history, physics, chemistry, biology, sociology, and economics. In both divisions, the initiative was placed on the student and studies were determined by student interests. The report states that, “The Committee proposes to abolish the evaluation of the degree in terms of credits, grades and term of residence ... To take the place of this system the Committee proposes to substitute two formal evaluations of the student's work, one when he applies for transfer from the Lower to the Upper Division, and the other when he comes up for his degree.” (Dewey 1931)

Georgia played a key role at the conference, one of the seventeen members. These members included prominent administrators, faculty, and education experts from around the country. The members held several panel discussions which were open to the campus and public. Georgia organized and served as secretary for the conference. The final report, written by John Dewey, emphasized a curriculum meant to be directed by student interests, as well as, to expand and broaden these interests. It encouraged learning by experience. The conference report also clearly stated a disdain for grades. “Grades are not ends in themselves nor is the attainment of grades a worthy incentive for work in college. ... If it is possible, and wherever possible, the consideration of grades should be eliminated as a method of appraisal of a student's attainments.” (Dewey 1931) These ideas became centerpieces in the BMC curriculum.

In the next few years, as Rollins College began to implement these progressive ideas, some of the faculty on the curriculum committee began to question if President Holt's conference plan should be abandoned. Holt took this as a personal attack, and not long after, he fired John Andrew Rice. Rice argued against his dismissal as an issue of freedom of speech. The case was brought to the attention of the American Association of University Professors (AAUP). At the hearing, Georgia and his colleague

Ralph Lounsbury represented Rice. While the AAUP did eventually side with Rice and sanctioned Holt, this took too long and Rice was forced to leave Rollins. In the meantime, Holt also refused to renew contracts for Georgia and Lounsbury. One by one, Holt called several faculty members into his office to ask them to sign “loyalty” agreements if they wanted to stay at Rollins. In all, eight individuals were either fired or resigned from Rollins in 1933 because of the controversy with President Holt. (For an insightful perspective on these years at Rollins College see Jack Lane’s book “Rollins College: A Centennial History.” (Lane 2017))

During the summer of 1933, four of the former Rollins faculty (Georgia, Rice, Dreier, and Lounsbury), and several former Rollins students, decided to start their own version of a liberal arts college. Robert Wunsch, another fired Rollins faculty who would join BMC a year later, knew of property near Asheville that the new college could rent during the academic year. By the Fall 1933 semester, BMC had rented a large hall at the YMCA Blue Ridge Assembly near Black Mountain, North Carolina, and was open for business.

Because the AAUP was still considering Rice's case, Georgia served as the first rector of BMC for one year until Rice took over. Georgia stayed at BMC for four years, teaching chemistry in what the BMC Preliminary Announcements described as meager laboratory settings. The Announcement stated, “Scientific apparatus and laboratory equipment will, of course, be on a simple scale. They will be sufficient, however, so that a small number of students may secure adequate training in laboratory work of undergraduate caliber in Physics, Chemistry, and Biology, ...” The Announcement goes on to point out the value to students of working in such a program. “Actually, in a pioneering enterprise, where the students may have to work to help fashion some of their own apparatus, much is gained that is usually lost where the latest, most expensive apparatus is found, ready for them to go ahead.” (BMC Records: General Files 1933-1956) After leaving BMC, Georgia went back to upstate New York and for several years was the Water Works Supervisor for the Filtration Plant at Cornell University.

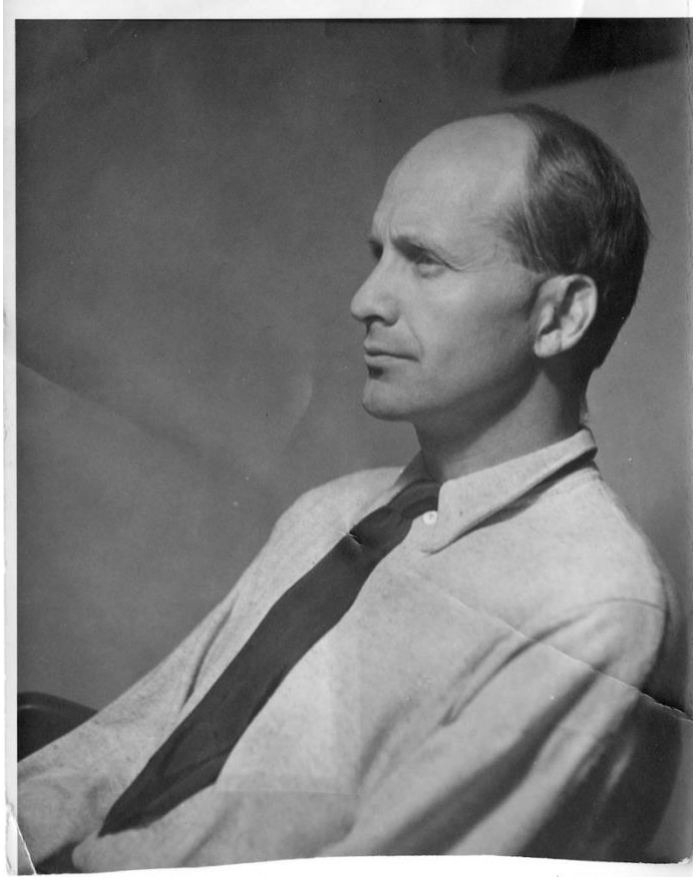

Figure 3. Theodore “Ted” Dreier. Courtesy of the Western Regional Archives, State Archives of North Carolina.

Theodore “Ted” Dreier (1902-1997) was another of Holt's golden personalities. He came from an upper-class New York family with significant connections to the art community and social reform movements of the time. His grandfather, John Casper Theodor Dreier, had immigrated to the US and worked his way up in the steel trading industry. John Dreier had been able to live the American dream and build a better life for his family. He believed that this should be possible for everyone. He instilled in his children a commitment to human rights and social reform. Ted Dreier's aunt, Katherine Sophie Dreier, was a modern artist and art collector; she was a founder of the Société Anonyme and helped to bring modernism to America. Ted Dreier's father, Henry Edward Dreier, was a N.Y. businessman. He was a strong advocate for women's rights, as well as, social and education reform. Ted Dreier's mother, Ethel Eyre Dreier, was president of the Women's City Club N.Y. and for 20 years was the head of Women's Suffrage Party of Brooklyn. (Harris 1987)

In 1923, Dreier graduated from Harvard with an A.B. He continued at the Harvard Engineering School, receiving a S.B. two years later. For the next five years, he worked for the General Electric Company in Schenectady, New York. Dreier's upbringing had instilled in him a commitment and respect for education. In 1930, he decided to change careers and become a college professor. That year Dreier was hired as an assistant professor of physics at Rollins College. However, he too got caught up in the Holt-Rice controversy and resigned from Rollins in protest of the Holt loyalty pledge.

It is not as a scientist that Ted Dreier will be remembered. His greatest achievements are in his work at BMC. In many ways the success of BMC, at least for the first 16 years, was due to Dreier's never-ending devotion and hard work at reaching out to find support to keep the college going. At BMC he played many key roles. He taught courses in physics and mathematics. While he did a fine job, no one would rank him as a teacher of the caliber of Albers or Rice. In many ways Ted Dreier filled in so that the college could run without an administration. Dreier served as the treasurer and chief fundraiser for the college most of his time at BMC. He did much of the official communication between BMC and the outside world. In particular, he worked tirelessly, year-round, to raise the funds to operate the small college.

Figure 4. Ted Dreier leading fundraising meeting at Black Mountain College, Lake Eden campus. Courtesy of the Western Regional Archives, State Archives of North Carolina.

III. Distinguished Scientists of Black Mountain College

Up until the last few years, when the college had shrunk to very few individuals, BMC always had faculty members teaching in the sciences, many teaching more than one science and other topics such as psychology and philosophy. While most have had successful careers in industry and academia, the following six individuals stand out as distinguished experts in their scientific areas.

Erwin Straus (1891-1975) was the first scientist of significant status to join the BMC faculty. It is difficult to categorize Straus into a specific discipline. In Germany, Straus had been a psychiatrist and neurologist at the University of Berlin. However, his education also included studies in philosophy. In particular, he had a great interest in Edmund Husserl's phenomenology. At times, Straus called himself a "medical anthropologist" or "phenomenological psychologist." In a paper from 2004, Richard Zaner discusses Straus's ability to combine medicine and philosophy. He writes, "Erwin Straus' accomplishments (not to say his interests and educational background) are extraordinary. His professional career was as a physician (psychiatrist) and scientist (neurologist), yet he possessed an uncommonly mature and compelling philosophical aptitude. His numerous insightful papers and books display his strong commitments to both disciplines and to the need to interrelate them constantly." (Zaner 2004)

Figure 5. Erwin Straus on the porch of Lee Hall, Black Mountain College. Western Regional Archives, State Archives of North Carolina

There is a short curriculum vitae for Straus in the Faculty Files for BMC, held at the North Carolina Western Regional Archives. (BMC Records: Faculty Files 1933-

1956) Straus was born on October 11, 1891, in Frankfurt, Germany. He did his university studies from 1911 through 1914, starting in Berlin and then finishing in Munich. He earned a Medical License in 1917 and received his Doctor's Diploma in 1919. For the next two decades he worked at various positions at the University of Berlin Hospital for Nervous and Mental Diseases and wrote several papers and books, establishing himself as a phenomenological psychiatrist. (Chessick 1999) In 1931, Straus was appointed as Extraordinary Professor to the Medical Faculty of the University of Berlin. In 1935, he was forced to leave his position by the Nazis.

In Germany, Straus had built a reputation. He had been a practicing physician from 1923-1935. He had published several scientific articles and books, establishing himself as a philosopher of medicine. He was a founding editor of the scientific journal, "Der Nervenarzt." One of his greatest works was the book, "Vom Sinn der Sinne," published shortly before he left Germany. (This was translated into English by Jacob Needleman as, "The Primary World of Senses.") The book contains, among other things, a not-too-favorable critique of work by the psychologist Ivan Pavlov and his famous experiment with dogs. It is still considered important today. Straus himself told Mary Emma Harris in 1971, "… it was very successful, and this almost gave me a job in England in Oxford at All Souls." (BMC Project, Erwin Straus) Contained in Straus's BMC Faculty Files are copies of his letters of recommendation. This includes recommendations addressed to All Souls and to the Academic Assistance Council. One of these is a short letter of praise from the renowned physicist Max Planck.

In 1938, when no position at Oxford worked out, and feeling the necessity to leave Germany, Erwin and Gertrud (Trudi) Straus came to the United States. They had friends who had been physicians in Germany and were at that time teaching at BMC. Fritz Moellenoff had written to Erwin Straus asking if he would be interested in teaching psychology at BMC. The Strauses knew nothing about BMC or North Carolina. However, in hopes of finding a job, Erwin was visiting Rhodes Scholars. Shortly after getting the letter from Moellenoff, he went to visit Frank Aydelotte, who at that time was the president of Swarthmore College (and would be the Director of the Institute for Advanced Study, in Princeton, 1940-1947). Aydelotte's sister Nell was married to John Rice. When Straus happened to ask if Aydelotte knew anything about BMC, he probably

got much more of an answer than he was expecting. (BMC Project, Erwin Straus) That Fall the Strauses joined the BMC community.

Erwin and Trudi Straus were members of the faculty from the Fall of 1938 until the summer of 1946 (taking a leave of absence from 1944-1946). Erwin taught psychology and philosophy. Trudi taught violin and German. Trudi was a very good musician and frequently performed with other music faculty on campus. In 1942 she joined the North Carolina Symphony Orchestra. The couple attended the first Summer Music Institutes held at BMC.

The Strauses were at BMC in the years just before and during the Second World War. These were important years for BMC. Though constantly struggling financially, at this time the college was actually growing. These years included the move to the Lake Eden campus, the construction of the Studies Building, and the conception of the summer programs and institutes. The Strauses were an important part of the community during these years. Erwin Straus served on the Board of Fellows for most of his time at BMC. In December of 1940, he proposed a plan to help faculty members, like himself, who had no prospect for income on campus during the summers and who had little money to travel. In order to generate income, Straus suggested that BMC hold “summer symposia that would bring together leaders in the arts, sciences, and humanities for informal, loosely structured colloquia.” (Harris 1987) While the exact details of his plan did not work out, it led to the first summer program. The early “work programs” combined academic studies with hands-on experience. This laid a foundation for the Summer Music Institutes that the college held a few years later. Straus also helped in the (eventually successful) efforts to have the Department of Education of North Carolina include BMC for funds from the GI Bill of Rights. In 1942, Straus proposed a plan to have servicemen send part of their pay to the college as a deposit on future education.

The BMC Bulletin, No. 7, from 1941, contains an essay by Straus titled, “Education in a Time of Crisis.” (BMC Records: General Files 1933-1956) This is part of an address Straus gave on May 5, 1940, as part of BMC’s first Annual Visitor’s Week. In it he argues that the important problems of mankind—the eternal questions—need to be understood by everyone not just the specialists. He goes on to say that true freedom is

not doing whatever you want, but comes when an individual can experience himself as part of a lasting whole, an order, that they have helped to form. This kind of connection of the individual to the wider world around them is central to Straus's philosophy. In the BMC Bulletin, Straus goes on to state that, "subject matter, important as it is, should not be the ultimate goal of learning." The goal of learning should be "To open the narrow horizon, to give [each student] standards of real greatness, to make him familiar with the complexity of the problems—that is the main point."

Figure 6. Erwin Straus with class at fireplace , Black Mountain College, Blue Ridge Assembly campus. Courtesy of the Western Regional Archives, State Archives of North Carolina.

In an interview with Mary Emma Harris, from October of 1971, Straus discusses the struggles that the sciences faced at BMC. He points out the importance at BMC of John Dewey's philosophy of learning by doing, which prioritizes production as compared to reading books. While this may work well in "painting or playing the piano or weaving," Straus argues that "Mathematics is acquiring and relearning and not displaying your own genius." He goes on to say, "I think these two things, using in some way your hands and your fantasy in artistic productions … and the work program were more estimated than the academic fields, which made it to some extent of course difficult to get students and made it difficult to advance the students if they wanted to go on to graduate school." (BMC Project, Erwin Straus) While Straus's statement reflects a naive view of Dewey's philosophy of learning, he is pointing out a recurring frustration among many of the science faculty members at BMC concerning the respect for academic rigor.

For two years, starting in 1944, Straus took a leave of absence from BMC. He had accepted a fellowship at the Henry Phipps Psychiatric Clinic at John Hopkins. His position gave him time to pass the Medical Board Exams in Maryland and opened up further job opportunities. The following year Straus resigned from BMC when he accepted the position as Director at the Veteran Affairs Hospital in Lexington, Kentucky. He continued at the VA Hospital until 1956. From 1963-1972, he organized a series of five conferences in Lexington devoted to "Phenomenology, Pure and Applied." Until shortly before his passing, on May 20, 1975, he continued to publish scientific articles and texts.

Nathan Rosen (1909-1995) was one of two of Albert Einstein's postdoctoral assistants who taught at BMC. Both men taught one year after finishing multiyear appointments working with Einstein at the Institute of Advanced Studies, in Princeton. Both were at the beginning of prestigious careers that would include distinctions in physics and as leaders in scientific education.

Figure 7. *Portrait of Nathan Rosen*, c. 1955. AIP Emilio Segrè Visual Archives, Physics Today Collection.

Rosen was born in Brooklyn, N.Y. He received a bachelor's degree in 1929 from Massachusetts Institute of Technology in electromechanical engineering. He continued at MIT and earned a PhD in Physics in 1932. Early in his career, he published significant work. One important paper from 1931 provided "the first reliable calculation of the structure of a hydrogen molecule." (Asher 1995) This paper used Rosen's idea of "entangled wave functions." From 1934-36, Rosen worked as an assistant to Albert Einstein. The two co-authored several papers. One of their most influential collaborations resulted in a famous thought experiment known as the "EPR paradox." For this 1935 paper, Einstein and Rosen worked with Boris Podolsky to show what they saw as a fundamental shortcoming with the theory of quantum mechanics. In particular, Einstein was not happy with the Copenhagen interpretation of quantum mechanics supported by physicists including Neil Bohr. This paper sparked an immediate response from Bohr and ignited an intense debate over how physicists interpret quantum mechanics and understand reality. Today most physicists side with Bohr and would accept the theory of quantum mechanics. The consequences of the paradox, thought to be unbelievable in 1935, are now considered acceptable. This is justified by theories involving concepts such as "quantum entanglement" that expand on Rosen's early entanglement ideas. Another paper that Rosen co-authored with Einstein

described the “Einstein-Rosen bridge,” which led to the modern concept of a space-time wormhole that has become popular in science fiction. (Asher 1995)

After working in Princeton, in 1936 Rosen took a position as Professor of Physics at the University of Kiev in the Soviet Union. Two years later, he returned to the US to supervise a “spectroscopic research project,” at MIT.

During the summer of 1940, Ted Dreier began a correspondence with Rosen about teaching at BMC. In a letter from July 20, 1940, Rosen writes to Dreier of his interest in finding a position that involved teaching as well as research. “In my opinion, research work and teaching are mutually beneficial. ... [C]ontact with recent developments helps one present the subject as something living rather than cut-and-dried. ... On the other hand, teaching helps to clarify one's ideas and stimulates the formation of new ones.” (Dreier Collection 1925-1988) Rosen goes on to add, “Besides this, I enjoy teaching for its own sake.” Albert Einstein supplied a recommendation letter as part of Rosen's application to BMC. In the short letter from July 27, 1940, Einstein praises Rosen, “He is very experienced in the whole field of theoretical Physics, intelligent, inventive and an indefatigable worker.” The letter goes on to say, “... you would find him a valuable acquisition to your teaching-staff ...” (BMC Records: Faculty Files 1933-1956)

On August 6, Rosen sent a telegram accepting an offer to teach at BMC during the 1940-41 academic year, for a salary of $1,200 and room and board for him, his wife and two children. (BMC Records: Faculty Files 1933-1956) That day, Dreier wrote a long letter back to Rosen acknowledging the telegram and supplying Rosen with some details. Dreier explains that faculty were expected to teach not more than two courses and to hold tutorials for advanced students. “There should be an elementary course offered if possible, open to students who have not even had high school physics. What you offer, however, we are only glad to leave in your hands.” (Dreier Collection 1925-1988) Dreier goes on to explain that a new method for deciding which courses to offer had recently been “inaugurated” by the faculty. All students and faculty in a broad field, like the natural sciences, would meet. Faculty would briefly describe possible courses they were prepared to teach and a discussion with students would determine which courses were in demand. Dreier noted that this avoided the difficulty of offering too

many courses that had little student interest, as well as, “greatly simplifies the matter of drawing up the schedule.” (Dreier Collection 1925-1988)

On April 27, 1941, Albert Einstein came to BMC to visit Rosen for a day. He brought along his sister, son, and daughter-in-law. There is a short article in the Black Mountain College Newsletter from May 1941 giving an account of the day’s events. Einstein is quoted as saying, “I want to congratulate you upon the work you are doing. You are here as a little community to work with your hands and with your brains, which is a good thing for you. ... Also, you are in such close contact with nature here. You are getting near to science in a way it should be generally done.” (BMC Records: General Files 1933-1956)

After a successful first year, Rosen planned to return to BMC for a second year. However, in a conversation over the summer, he learned from Dreier that the campus had a policy on restricting the number of Jews in the faculty and in the student body. In a letter from August 26, 1941, Rosen explained that learning this had been quite a shock for him. He further implied that Dreier had told him this was not to be discussed at a faculty meeting. Rosen said that, “It seemed to suggest not only a lack of tolerance, but also a lack of democracy.” (Dreier Collection 1925-1988) In this letter, Rosen requests that the BMC faculty release him from his obligations so that he can accept a position at the University of North Carolina (UNC). Dreier wrote back on August 29, “I should like to convince you that you are mistaken so that if you do leave, we can at least part with a better understanding.” (Dreier Collection 1925-1988) Dreier states that he had only suggested talking with others in small groups before taking this issue to a large faculty meeting. In the bulk of the three-page letter, Dreier defends the policies.

Rosen did in fact leave BMC that summer and took the position in Physics at UNC. He stayed in Chapel Hill for over a decade. In 1953, he moved to Israel where he joined the faculty at the Technion. Rosen arrived in Israel at the perfect point in time to have an important and lasting impact on the fledgling nation's higher education system. For the next quarter-century, he would play a leadership role in science education in Israel and internationally. At the Technion, Rosen held several influential positions, including at various times serving in Dean positions, serving as Head of the Physics Department, and serving as Head of the Department of Nuclear Engineering. He was a

founding member of the Israel Academy of Sciences and Humanities and also helped to establish Ben-Gurion University. Rosen was a founding member of both the Physical Society of Israel and the International Society for General Relativity and Gravitation. At times, he served as president for each of these societies. Throughout his career, Rosen continued his research on general relativity and gravity, publishing until his passing in 1995. (Asher 1995)

It does seem that Rosen left BMC with a "better understanding." He stayed in contact with people at BMC and with Ted Dreier in particular. He occasionally visited the campus and helped BMC science students. Rosen taught a course on atomic physics during the summer session of 1949. Trueman McHenry, a student at BMC from 1948-1952, said that Rosen had a friendship with Max Dehn, a BMC mathematics professor. Rosen helped McHenry to apply for and begin graduate work in mathematics at Chapel Hill. (McHenry 2017 personal email) In fact, even as Rosen was leaving BMC, he was willing to recommend another physicist he felt would be a good replacement. Rosen recommended that Dreier offer the position to another of Einstein's assistants.

Figure 8. *Portrait of Peter Bergmann,* March 4, 1959. Syracuse University, courtesy AIP Emilio Segrè Visual Archives.

Peter Gabriel Bergmann (1915-2002) was born in Berlin. His mother was a pediatrician and his father a professor of chemistry. In 1931, at the age of 16, Peter Bergmann began his university studies in Germany. Early on he showed a strong potential and interest in theoretical physics. However, because he was Jewish, his prospects in Nazi Germany quickly deteriorated. In 1933, he left Germany and was able to continue his studies at the Charles University in Prague. He received a doctorate in 1936 at age 21, solving a

problem in general relativity. His advisor was Philipp Frank, a philosopher, scientist, and member of the Vienna Circle who held the position at Charles University previously occupied by Einstein. With a strong recommendation from Frank, Bergmann applied for and received a position at the Institute of Advanced Study, in Princeton. Bergmann worked as one of Einstein's assistants for the next five years. Bergmann's research with Einstein signifies some of the first steps in modern science to find a single “unified theory” of matter that would unite both the theory of quantum mechanics (small things) and Einstein's theory of general relativity (big things). Both men would spend the rest of their lives on a quest to find this illusive theory of everything. (Goldberg and Schucking 2003)

Dreier wrote Bergmann on August 30, 1941, after calling him that morning to “inquire if [Bergmann] would be interested in joining [the BMC] staff for the coming year to teach Physics...” On the phone, Dreier had discussed Rosen's reasons for leaving BMC. In this letter, Dreier mentions that “in the light of subsequent conversations Nate has changed his idea about our lack of democratic procedure, but he told me last night that on everything else his feelings remained the same.” (Dreier Collection 1925-1988) Dreier notes that he has “wired three references” and as encouragement he includes, “We liked you and your wife very much when you visited here this spring, and a number of us hoped that some time you might be able to join our community.” A telegram to Dreier on September 1, 1941, reads, “My collaborator Peter Bergmann is a very capable theoretical physicist with good insight in general physics and chemistry. He is laborious, intelligent, and good natured. I vouch for his political and personal reliability. Kind Regards. Albert Einstein.” (Dreier Collection 1925-1988)

Bergmann and his wife, Margot Eisenhardt Bergmann, both taught at BMC for the 1941-42 year. Peter taught physics and Margot taught chemistry. While at BMC, Peter finished and published his text book, *Introduction to the Theory of Relativity*. The book included a foreword by Einstein. It was the first systematic overview of relativity and became the definitive text book on the subject for decades.

For two years after leaving BMC, Bergmann was an assistant professor at Lehigh University. He followed this with three years of “war research,” studying underwater sound at Columbia University and the Woods Hole Oceanographic Institution. In 1947,

Bergmann began as an assistant professor in the Department of Physics at Syracuse University, where he stayed until he retired in 1982. He then moved to New York City and was awarded a visiting professor position at New York University, which he held until shortly before his death in 2002. Quoting from a 2003 obituary in *Physics Today*, “When Peter began his career at Syracuse in 1947, no US physics department had a center for research in general relativity. ... [At Syracuse] Peter created one of the first groups specifically concerned with studying the general theory of relativity with the intent of reconciling that field with quantum theory. ... Twenty years later, there were more than a dozen centers of active research in general relativity.” (Goldberg and Schucking 2003) Shortly before his passing, in 2002, Bergmann's life work and leadership in the study of general relativity was recognized, when he was awarded, together with John Wheeler, the Einstein Prize by the American Physical Society.

Fritz John Hansgirg (1891-1949) was another refugee and leading scientist who found his way to BMC. While the college had looked towards academia to find faculty in physics, BMC found one of its most renowned chemists by recruiting from industry. On June 24, 1942, Dreier received a letter from Karl Terzaghi, an Austrian Mechanical Engineer who was at that time working at Harvard. After discussing plans to meet Dreier in Winchester, Massachusetts, Terzaghi mentions that “The other day we learned that an old friend of ours, Dr. Fritz Hansgirg, has landed in an internment camp in Oklahoma.... He was arrested on account of vague rumors that he is a Nazi. ... [W]e have

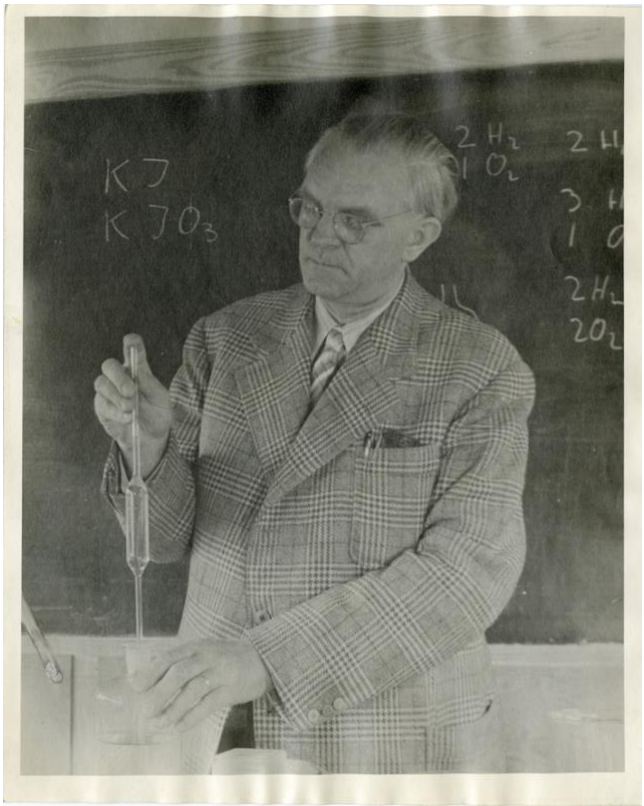

Figure 9. Fritz John Hansgirg. Courtesy of the Western Regional Archives, State Archives of North Carolina.

known him and his wife intimately for many years we can vouch for the fact that both are utterly opposed to Nazism." The letter goes on to explain that there had been two hearings before the Bureau of Immigrations recommending Hansgirg be released, however he was required to "occupy a position where he can do no harm." Terzaghi writes that, "An official of the Department [of Justice] intimated ... that a teaching appointment in an educational institution of high standing would constitute such a position. ... It occurred to me that Black Mountain College would be an ideally suitable place." (Dreier Collection 1925-1988)

The BMC Faculty Files for Hansgirg include his curriculum vitae dated July 21, 1942, composed while he was being held in Stringtown, Oklahoma. (BMC Records: Faculty Files 1933-1956) This is written more as a letter and less as a professional resume. In four typed single-spaced pages, it provides a detailed account of Hansgirg's professional life up to and including his detainment by the F.B.I. Hansgirg was born in Graz, Austria. In 1912, he received a Ph.D. from the University of Graz and was appointed as a research fellow and assistant lecturer in the Chemistry Department. In 1916, he left the university to direct research for the Fanto Oil Company in Austria. For the next two decades Hansgirg worked as an inventor and administrator in a diverse array of industrial fields. Throughout this time he acquired international patents for several important industrial processes. He began by working in organic chemistry on dyes. He later worked in the oil industry designing and building distillation plants. Eventually he became interested in electrothermic processes and metallurgy. In 1928, Hansgirg invented and patented a carbothermic reduction process for mass-producing highly pure magnesium. This process had important military implications. A pilot plant was built using Hansgirg's process in Radenthein, Austria. Hansgirg served as the consulting engineer for the project, as well as a director and shareholder of the company building the plant. In 1934, Hansgirg sold his patent to a Japanese-American company and was appointed to design and construct a magnesium plant for them in Korea. By 1940, the "pro-axis atmosphere" in Japan convinced Hansgirg to relocate to the United States. Once in America, Hansgirg worked with the industrialist Henry J. Kaiser to build a magnesium plant in California. By 1941, this plant was operational, but

plagued with problems. In particular, Hansgirg's carbothermic process produced magnesium dust which is highly explosive.

On December 17, 1941, ten days after the Japanese attack on Pearl Harbor, Hansgirg was detained by the F.B.I. For a while, he was held in a jail in Santa Clara County, California, where he could continue consulting at the plant. Later he was moved to US internment camps, in Texas and Oklahoma. In the summer of 1942, Ted Dreier went to Stringtown, Oklahoma, to meet Hansgirg and his wife. After an exchange of several letters between references, lawyers, and government officials, on October 8, 1942, Fredrick Mangold, Secretary for BMC, wrote to Hansgirg informing him that he was being appointed as Professor of Chemistry for the 1942-43 academic year. (BMC Records: Faculty Files 1933-1956)

For several years, the college was required to keep records about Hansgirg's activities and to provide weekly reports to the Immigration and Naturalization Service. Hansgirg was not allowed off the campus without supervision and each such occurrence was documented and reported to the Department of Justice. For five years, 1942-1947, Hansgirg taught chemistry and physics at BMC. His wife Maria provided tutorials in French. Because he had come with “modest funds,” he was able to take only room and board as salary.

While at BMC, Hansgirg was a key player in one of the more creative schemes to help keep the small college financially secure. There were deposits of the magnesium-rich mineral olivine on the campus. Using processes that Hansgirg would devise, BMC hoped to produce magnesium from the abundant Western Carolina olivine. With Dreier's help, in 1944, Hansgirg set up the North Carolina Magnesium Development Corporation (NCMDC). An annex was built on the science building to house a pilot plant and laboratory for research. As payment for use of their property, BMC was given 20% stock in the corporation. For a while this enterprise did provide some support to the college. However, in the summer of 1948, the magnesium plant and the rest of the science building at BMC burned down and the NCMDC never really got back off the ground.

After the war, Hansgirg was given more freedoms. In a letter from July 8, 1946, Hansgirg writes to Molly Gregory at BMC that he is returning from Canada with a “permanent entrance to the U.S.” and that he will be traveling to New York, Princeton,

and to visit his friend Terzaghis in Winchester. (BMC Records: Faculty Files 1933-1956) Around this time Hansgirg realizes that to get the NCMDC going he would need to limit his teaching at the college so that he could focus his energies on research and travel to attract further support. In a letter from May 2, 1946, Hansgirg tells Dreier that he will "... remain in the closest possible connection with the College ... even if the very important development of the new magnesium ideas should prevent me for a year or two from active participation." (Dreier Collection 1925-1988) From the Fall of 1947 to the summer of 1948, Hansgirg took a leave of absence from BMC, but remained on the faculty. During this time, he moved to New York and began work with the Electro-Metal Corporation and did consulting for Standard Oil in New Jersey. On July 23, 1949, Hansgirg unexpectedly died at the age of 58. It has been speculated that decades of inhaling magnesium dust was the root cause of death.

In an obituary in the *Journal of the Elisha Mitchell Scientific Society*, Natasha Goldowski, another BMC science faculty, talks of Hansgirg's teaching. "His students were fascinated by his immense knowledge and unlimited enthusiasm with which he colored his lectures. ... He imbued them with the intellectual curiosity so exceedingly important for every student of science." Goldowski mentions how unusual it is to find someone with such a broad background in organic chemistry, metallurgy, electrochemistry, and physics. "It has to be noted also that Dr. Hansgirg was a very fine musician, had an extraordinary knowledge of painting, and an extremely wide knowledge of literature." (Goldowski 1950)

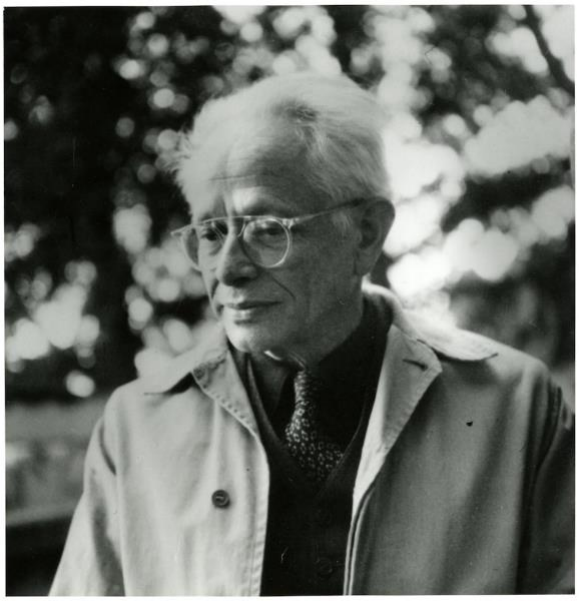

Figure 10. Trude Guermonprez, *Portrait of Max Dehn*. Courtesy of the Western Regional Archives, State Archives of North Carolina.

Max Dehn (1878-1952) was another refugee scientist of the highest caliber who found his way to BMC after escaping the turmoil of World War II. Dehn was born in Hamburg, Germany. His father was a physician. He had brothers who were lawyers and businessmen and a sister who

played in the Hamburg Opera orchestra. In 1900, at age 21, Dehn received a doctorate at the University of Göttingen, working with David Hilbert, one of most important mathematicians of that time. Dehn's earliest work was in geometry. In the next three decades, Dehn did foundational work in new areas of mathematics such as topology and infinite group theory. His work always had a geometric nature. His special ability was to find simple geometric diagrams and figures that explained complicated ideas that seemed to have nothing to do with geometry. Mathematics literature contains several terms referring to him, “Dehn diagrams,” “Dehn algorithm,” “Dehn twist,” “Dehn surgery,” to provide a few examples.

Dehn began his career in 1901 at the University of Münster. He worked his way up through the German university system holding positions in Kiel, Breslau and finally at the University of Frankfurt. He stayed in Frankfurt from 1921 until 1935 when, because of his Jewish ancestry, he was forced by the Nazis to resign. While in Frankfurt, Dehn and his mathematics colleagues ran a seminar on the history of mathematics where faculty and students read ancient texts by Archimedes, Ptolemy, Descartes, Kepler, and other important historic mathematical works. Participants read the text in their original (or oldest known) versions, requiring knowledge of several languages. In 1938, Dehn was arrested the day after Kristallnacht, but was released because “the jails were too full.” The following day Dehn and his wife, Toni, went into hiding and eventually escaped to Norway where Max found a position at the Technical University in Trondheim. However, when the Germans invaded Norway in 1940, the Dehns again had to flee. After surviving a long and dangerously cold Trans-Siberian train journey and then sailing from Japan across the Pacific Ocean, the Dehn's arrived in San Francisco on January 1, 1941. Dehn taught for a short time at several US institutions. He started with a temporary position at the University of Idaho, in Pocatello. He then moved to Chicago for a position at the Illinois Institute of Technology. He was not happy with the “turbulence of the big city” and took a job at St. John's College, in Annapolis, Maryland. While he was at St. John's in 1944, Dehn visited and gave two talks at BMC. (For more details about Dehn’s career before coming to BMC see (Peifer 2010).)

Erwin Straus, writing from BMC, invited Dehn to visit the campus in March of 1944. The trip must have gone well, because on Christmas Day, 1944, Straus wired

Dehn to let him know that the Board of Fellows had authorized Straus to offer Dehn a position at BMC. (BMC Records: Faculty Files 1933-1956) Dehn negotiated the salary up to $40 a month including room and board for him and his wife. For the next seven years, 1945-1952, Dehn taught mathematics, Greek, Latin, and philosophy at BMC. His mathematics classes included “Geometry for Artists.” BMC student William Trechler described the class as follows. “Dr. Dehn introduced us to points, lines, planes and solids; cones sectioned into circles, ellipses, parabolas, and hyperbolas; spheres and regular polyhedrons. ... Professor Dehn told us the 25 prime numbers from 1 to 100, and then asked us, as an assignment, to find as many as we could above 100. He told us about Fibonacci's Number and its relationship to the Golden Mean of the Greeks, and to volutes so commonly observable in nature.” (BMC Project, William Treichler)

Another student, Harry Weitzer, describes Dehn's philosophy classes. “Max Dehn was a sort of mental ‘Windex’. He encouraged you to look through windows previously opaque, to think about dense subjects like Death, What is Number?, and Love. Few subjects failed to interest him, and through him, you. ... We had no text, and his assignments were such as ‘next time we will talk about Knowledge, think about it in the meantime’. The strategy was Socratic, ... He was very patient, and would not give up until you had said exactly what he had been hunting for.” Weitzer says his favorite class with Dehn was an advanced geometry class. Describing Dehn's teaching of that class, Weitzer writes, “Once, standing on a chair (as his example required the reach), his chalked line wrapped neatly around a black painted pipe that crossed the board. Proud of his proof, he asked, ‘can you see the music?’. To him, the harmony of the - mathematical relationship and those of music were of the same order.” (BMC Project, Harry Weitzer)

Dehn could be described as a Renaissance man. He knew several languages, including Greek and Latin. He loved and studied music and the arts. He played the cello. He had studied the classics and had a deep knowledge of many areas of philosophy. All his life Dehn had enjoyed hiking and the outdoors. At BMC Dehn was well-known for taking students, faculty and guests on long hikes to find rare wildflowers in the local mountains. Dehn's student Weitzer writes, “His five two frame was often viewed from the rear as he led a pack of hikers up and down the ridge trails, never

seeming to tire." (BMC Project Harry Weitzer) Dehn's love and respect for nature can be heard in a letter he wrote to Albers, in which he shared the benefits of teaching at BMC, "Not to forget the beauty of the surrounding nature which, I think, is of the greatest value to transform young and old people who live in it." (BMC Records: Faculty Files 1933-1956)

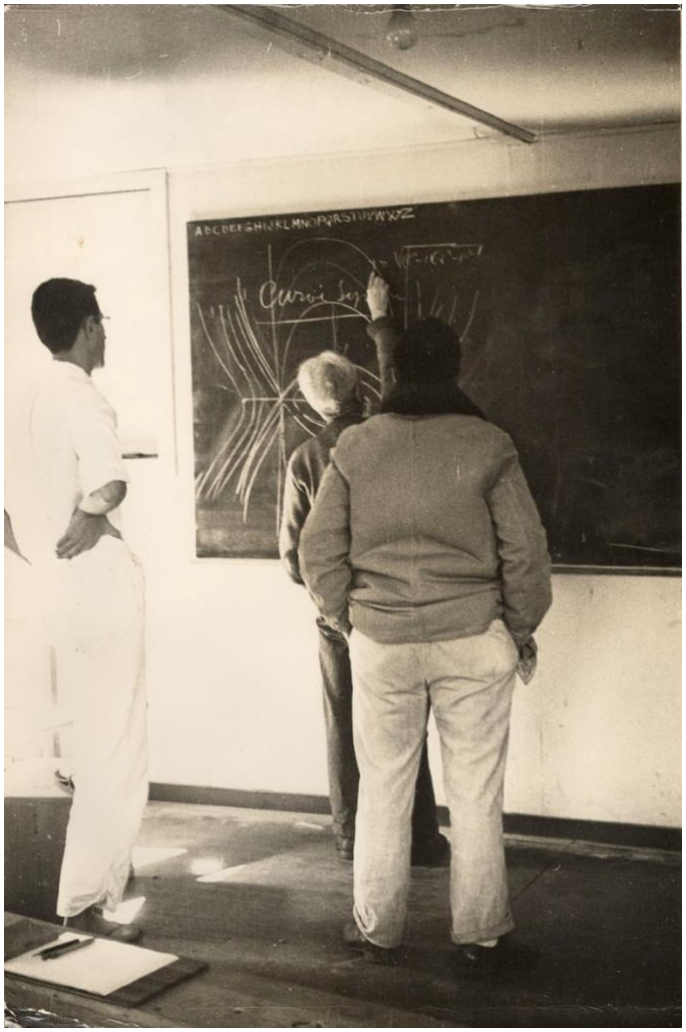

Figure 11. Photographer unknown, *Max Dehn with BMC Students Nick Cernovich and Willie Joseph,* c. 1950. Vintage gelatin silver print. Collection of Black Mountain College Museum + Arts Center. Gift of Frank Hursh.

Dehn passed away from an embolism in 1952. He was 73 years old. He had just retired from BMC and had plans to move to the town of Black Mountain and possibly take a trip to visit Germany. The day before, Dehn had been climbing the mountainside marking trees to protect from loggers. Dehn's ashes are buried on the old BMC campus in the mountains he loved so much.

Figure 12. Marie Tavroges Stilkind, *Natasha Goldowski*, Black Mountain College. Courtesy of the Western Regional Archives, State Archives of North Carolina.

Natasha Goldowski

Renner (1901?-1966) was born in Moscow, where she studied ballet while she completed high school. Her family had been wealthy and was forced to flee Russia because of the revolution. (Harris 1987) The BMC Faculty Files includes a short curriculum vitae outlining her career before BMC. (BMC Records: Faculty Files 1933-1956) She did her university studies at the University of Paris, where she earned an engineering degree. Continuing in Paris, she received a Doctorate in Science in 1935 and a PhD in 1939. During her graduate work she traveled to Sweden, England, and Austria and became an expert on corrosion and electrochemical potentials of metals. As the war moved to France, she and her mother, Madame Anna Goldowski, fled to the US. Renner began with a job in industry, but was quickly pulled into the Manhattan Project, the U.S.-led research to build the first nuclear weapons. From December of 1943 until July 1945, she worked at the University of Chicago. While there she taught night classes on corrosion at the Illinois Institute of Technology. For the next year she worked at the Palmer Laboratory at Princeton University. She was one of the top-ranked women scientists in the Manhattan Project and was able to solve some crucial problems with corrosion of containers storing uranium. (Howes and Herzenberg 1999) Following the war she was no longer allowed to do research in militarily sensitive areas because she still had family living in Russia.

A colleague at Princeton had notified the BMC faculty that Renner (at the time Goldowski) might be interested in a faculty position at BMC. On June 13, 1946, Albert Levi, a BMC faculty member, wrote to Renner asking her to send credentials, a vita, and

to consider coming to the campus for a visit. Complications with determining if Hansgirg would be teaching or not made it difficult to know if BMC would have a position available. Things did not work out in 1946, however the next summer, Levi wrote Renner again to inquire if she was still interested. Renner taught both chemistry and physics at BMC from the Fall of 1947 until the Spring of 1953. She also developed a course, at her students' request, called “Techniques of Learning,” which was offered for the first time in the summer of 1949. This course focused on writing and not on science. In it she taught students to read articles, write abstracts, and then use “the abstracted material for a composition, the topic of which was related to, but not identical with, the original article.” A former BMC student, Bill Treichler, wrote about her teaching, “Natasha was a wonderfully enthusiastic teacher, always delighted when a student grasped a concept or she caught some nuance herself. ‘For-mi-dab-la!’ she would exclaim.” (BMC Project, William Treichler)

The BMC Bulletin from 1949 (vol 7, no 3), contains a paper that Renner (at that time Goldowski) presented to the Southeast Section of the American Physical Society. (BMC Records: General Files 1933-1956) In the paper titled “Physics for the Liberal Arts Student,” she argues that, in the future every student will “encounter the scientific approach to, and scientific interpretation of, various data and therefore will have to carry with him a training enabling him to understand and to perform these processes.” For Renner, the reason for teaching physics to students of the humanities “consists mainly in the development of the capacity of the systematic analysis of data—any data—followed by equally strict and systematic synthesis.” She concludes that, “… physics as a subject of the ‘Humanities’ curriculum becomes primarily not a goal but a means of developing the mind so that it is able to pursue a logical trend of thought within the limits of the material under consideration.”

In 1953, after marrying Eric Renner, a BMC student, Natasha resigned and moved off campus to start a mushroom farm. A few years later, in 1956 she took a position of associate professor of physics at Alfred University where she stayed until retiring in 1962. While at Alfred she continued to write and give talks. In particular, she continued to have an interest in the education of scientists. In 1962, she gave a talk at the meetings of the American Association of Physics Teachers and the American

Physical Society in New York stating that “mass producing scientists is bound to fail, no matter how much money is poured into such programs.” (The Fiat Lux 1962) She advocated for more individualized teaching with an emphasis on understanding as opposed to memorizing facts. After retiring from Alfred, she and her husband moved to Guadalajara, Mexico, where she died in 1966.

It is interesting to note that in the book *Mexico’s Ancient and Native Remedies,* Natasha Renner is credited for supplying several short remedies for a range of problems, from headaches and high blood pressure to “anaemia” and dysentery. For pain in the head and back, she suggests, “Cut plenty of ‘salvia’ flowers. Cook them in water with a little ‘valeriana’ (valerian). Drink a cup after you have ‘comida’ (heavy two to four o’clock dinner) and before you go to bed.” (Winter 1968) Renner’s other remedies also suggest drinks or compresses made from the fruits, flowers, and leaves of native Mexican plants. The credits for the book indicate that Renner was living in San Blas, Nayarit, Mexico at the time she supplied these contributions.

By 1953, after Dehn had passed away and Renner had resigned, there were no scientists at BMC. The college was in dire financial crisis and did very little hiring. The new rector, Charles Olson, did not have the fundraising skills and connections enjoyed by some of the past faculty. Fundraisers in 1953 and 1954 were not successful. The last years of the college were difficult as the community dwindled. Olson’s hopes and various attempts to save the college concentrated on the art programs. The faculty had taken only half their salary since 1950. They hoped to get this money back when things turned around. On September 27, 1956, the Board of BMC voted to dissolve the corporation and instructed Olson to liquidate all assets and arrange to pay all the college's debts.

There have, of course, been other scientists that taught at BMC. In particular, there have been several faculty members in biology. For example, J. Richard Carpenter, a young expert in plant ecology, taught at BMC from 1940 until 1942, when he was tragically overcome with cancer and passed away at the age of 30. And Anna Moellenhoff taught biology and German. She and her husband, Fritz Moellenhoff, both taught at BMC from 1935 until 1939. They had been physicians in Germany. Victor Sprague taught biology and zoology at BMC from 1951-52. There have also been

several scientists who, while not full-time faculty members, served on the Advisory Board, taught in the summer, came for a short visit, or supported the campus in other ways. While it would be impossible to cover every scientist who had a connection to BMC in this short article, it is hoped that by examining these individuals something has been learned about the role the sciences played at BMC.

Above all, this paper has illustrated that the sciences were a significant part of the BMC culture, curriculum, and community. The individuals considered here served on the Board of Fellows, served as rector, did construction work, participated in the Summer Institutes, did recruiting, did fundraising, and more. They were part of the community in every way. It is also important to notice that there were science faculty who, in their own disciplines, are considered as important as the artists that taught at BMC are considered in the art world. These individuals brought with them a deep understanding of modern science. When considering the fermentation of ideas that happened at BMC, I cannot help but wonder what effect this contact between artists and scientists—many on the forefront of their discipline—had on our world today? Have scientific ideas, correctly or incorrectly understood, made their way into modern and contemporary art? Has work on the unified field theory been influenced by the artists at BMC? This leads to a fundamental question. How much was the interdisciplinary liberal arts mix of science and art an important component in what happened at BMC? These are difficult questions that may never be thoroughly answered. In any case, by looking at these short biographies of eight scientists, it is clear that to truly understand BMC, the sciences, as well as the arts, must be considered.

Notes on archival material: The Western Regional Archives in Asheville, North Carolina, holds several valuable collections that include information about BMC. The archives hold the official records from the college, including faculty records, student files and course catalogs. Of particular interest for this article is a large collection of Theodore and Barbara Dreier's correspondence, donated to the archives by the Dreier family. As a founding member of BMC and the college's treasurer and chief fund raiser for most of the first 16 years, Ted Dreier's letters contain a rich source of information about the college. As a science teacher, his letters provide insight and sensitivity to the sciences.

In researching this article, relevant material was also found at the Rollins College Archives and the Alfred University Archives. This article is intended to bring together much of this information and to provide a broad picture of how the sciences fit into the curriculum and culture of BMC. The author is in debt to the helpful and resourceful archivists who work at the archives mentioned above. In particular, the staff at the WRA have been very helpful.

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