

*Editor's note: The preceding article by Lyle Jensen was solicited for what we hope will be a new column on the history of crystallography. Our reasoning is that our Association is approaching the age that many members know our "Founding Fathers" only by their publications, whereas many of our senior members knew most of these people personally. Lyle's article was written especially for the newsletter; then a diskette was received from Bryan Craven bearing Leroy Alexander's Pittsburgh Diffraction Society Banquet Address, excerpts from which follow:*

### **Surain Singh Sidhu and the Early Pittsburgh Diffraction Conferences**

To begin with, I disclaim any personal role in the founding of the Diffraction Conferences. My relationships with Dr. Sidhu and the conferences commenced after my arrival in Pittsburgh to join the Mellon Institute staff in January 1946. Thus my first involvement with the meetings was with the fourth Conference, December 5, 6 and 7, 1946.

My recollections of Prof. Sidhu are of a man of serious but pleasant demeanor who was deeply devoted to his profession and loved teaching. He seemed to possess inexhaustible enthusiasm, energy, and drive. These characteristics he transmitted to all around him, in particular, his multitude of students. His influence extended throughout the Tri-State area, being further disseminated by his students, most of them drawn from the industrial sector.

In 1948 he embarked on neutron diffraction researches, which took him on a commuting basis to the Argonne National Laboratories of the University of Chicago. In 1952 he relinquished his post at the University of Pittsburgh and moved to the Chicago area to devote full time to research on metal hydrides and a variety of metallic alloys. However, in the ensuing years his faithful support of the Diffraction Conferences continued until shortly before his death in 1966 at age 64. He should rightly be remembered as the true founder of the Pittsburgh Diffraction Conferences.

Prof. Surain S. Sidhu was one of the Physics Department staff from the mid-1930s until his departure in 1952. During that period he and Prof. Charles S. Barrett, of the Carnegie Institute of Technology (CIT), were undoubtedly the foremost educators in the Tri-State area who placed special emphasis on the techniques and practical applications of X-ray methods. In the late 1930s and in the 1940s Prof. Sidhu taught afternoon and evening classes in X-ray diffraction and industrial radiography. It is not an overstatement to say that most of the Pittsburgh-area industrial analysts learned these methods from him. . . .

Prof. Sidhu was a registered radiation physicist. In this capacity he calibrated medical X-ray equipment and checked safety aspects of industrial radiographic installations throughout the area. In one notable episode he retrieved a valuable ampule of radium that had disappeared at one of the large Pittsburgh hospitals. With the aid of a Geiger counter he eventually located it in the city sewer system.

The inception of the Pittsburgh Diffraction Conferences cannot be properly understood without reference to parallel developments in applied spectroscopy conceived by another Pitt physics professor, Mary Warga. She and Prof. Sidhu chanced to have optical and X-ray laboratories on opposite sides of the fourth floor corridor in Thaw Hall. Both lectured in Room 105. In many respects their courses dove-tailed or overlapped in content. Therefore, most students from the industrial laboratories would register for both Sidhu's and Warga's courses.

In the Spring of 1940, largely through the efforts of Prof. Warga, the first Conference on Applied Spectroscopy was held in Lecture Hall 105, Thaw Hall. Attendance at this first conference was about thirty, but it increased dramatically in ensuing years, so that the third conference in 1942 was moved to the more commodious facilities of Mellon Institute, when some two hundred attended. Subsequently the meetings grew so large that it was necessary to move them downtown to the William Penn Hotel. (In the late 1950s Prof. Warga took a leave of absence to become the first Executive Secretary of the Optical Society of America with offices in Washington, DC. This position became a permanent one, which Mary Warga held for fifteen years.)

We now turn to the early Pittsburgh Diffraction Conferences. Since I was not present at the first three, I rely here largely on information obtained from some of the key persons who attended one or more of them: E. A. Gulbransen, W. L. Fink, Mary

Warga, Stanley Brosky, Lawrence Hofer, Greta (Scott) Baur and Arthur Pitchford.

The success of the Conferences on Applied Spectroscopy helped to convince Prof. Sidhu of the value of similar conferences in the X-ray analytical field. His proposal for an initial meeting was enthusiastically endorsed by Earl Gulbransen and Charles S. Barrett, who agreed to give informal talks as a basis for discussion. This first meeting was held on Saturday, January 16, 1943, in Lecture Room 105, Thaw Hall, University of Pittsburgh, and was entitled "Conference on the Uses of X-rays, X-ray Diffraction Cameras, Electron Diffraction Cameras and Electron Microscopes." Informal remarks followed by discussion were made on these subjects respectively by Sidhu, Gulbransen, and Barrett. . . .

As near as we can determine, the following persons attended this first meeting: Prof. S. S. Sidhu, (University of Pittsburgh); Dr. Earl A. Gulbransen, (Westinghouse Research Laboratories) (WRL); Prof. Charles S. Barrett, (Carnegie Institute of Technology (CIT)); Mr. R. K. Scott, (Hall Laboratories, later Calgon); Dr. S. Smith, (WRL); Stanley Brosky, (Pittsburgh Testing Laboratories); Dr. W. L. Fink, (Aluminum Company of America) (ALCOA); and one or more of the following: Prof. Mary Warga, (University of Pittsburgh); Mr. Howard Oshrey, (U.S. Bureau of Mines); Prof. Robert Mehl, (CIT) Everyone present was enthusiastic about having another conference in 1944.

Some further information about Prof. Sidhu: He was the owner of the first Weissenberg camera in the Pittsburgh area. One of his earlier students, Orvil Bolduan, was experienced with the instrument and instructed Prof. Sidhu's students in the details of its operation. Sidhu's laboratory was on the ground floor of Thaw Hall. A neighboring suite housed some animal cages. From time to time a rat would escape and enliven proceedings in the X-ray lab. In those days X-ray generators were home-made, and often the X-ray tube itself. Only Machlett tubes were commercially available. In the late 1930s two textbooks were in use: "Applied X-rays" by G. L. Clark and "A Study of Crystal Structure and Its Applications" by

Wheeler P. Davey. In 1943 an eagerly-awaited book appeared, "Structure of Metals" by C. S. Barrett. This and "X-rays in Practice" by W. T. Sproull (1946) were subsequently used by Prof. Sidhu in his classes.

Publicity for a second conference resulted in such a wide-spread and favorable response that it was decided to move to Mellon Institute where more spacious facilities were available. The second Pittsburgh Diffraction Conference was held there on Friday afternoon and Saturday, November 3 and 4, 1944. The Friday afternoon and Saturday morning sessions were chaired respectively by W. L. Fink and C. S. Barrett. The eleven papers comprised such diverse topics as X-ray and electron diffraction techniques, electron microscopy of colloidal materials, X-ray diffraction studies of bread(!) (A&P Company), glycerides, refractory materials, preferred orientation in metallic systems, and quartz in industrial dusts.

After Friday's session a subscription dinner was held at the Webster Hall Hotel. The price was \$2.25, gratuity included! An evening meeting in the Mellon Institute Auditorium, presided over by Prof. H. Longenecker of Pitt, featured lectures by two noted out-of-town speakers:

Wheeler P. Davey (Penn State): "X-ray Diffraction Studies of Materials of Physical and Metallurgical Interest" and I. Fankuchen (Brooklyn Polytechnic Institute): "X-ray Diffraction Studies of Compounds of Biological Interest." . . .

The third Conference (1945) followed the format of the second. The Friday evening lecture was by Maurice L. Huggins and was entitled "The Use of Fourier Syntheses in Crystal Structure Analysis". Another highlight of this meeting was a testimonial dinner at the Webster Hall Hotel in honor of Wheeler P. Davey for his pioneering contributions to crystallography and X-ray diffraction analysis. Never was such recognition so richly deserved!

Prof. Davey played a dominant role in the Joint Committee for Powder Diffraction Standards (JCPDS) from its inception until about 1940. Later on he and his associates at Penn State contributed a substantial portion of the best-authenticated powder diffraction patterns to the ASTM

file. In the late 1940s these were measured using a diffractometer with balanced filters. Sadly, Prof. Davey became crippled with Parkinson's disease. Despite this handicap he continued teaching and participating in the JCPDS program as long as humanly possible. He seldom missed a meeting of the Joint Committee and attended the early Pittsburgh Diffraction Conferences. After his retirement he served as chairman and editor of the Joint Committee until shortly before his death in 1959. . . .

Beginning in the late 1940s the commercial displays were set up in the lobby outside the Mellon Institute Auditorium and in the third-floor hall outside the conference and social rooms. The first complete X-ray generator unit, including powder cameras, was displayed by Art Pitchford. It was manufactured by the North American Philips Company and distributed in Pittsburgh by the Allegheny X-ray Sales and Service Company, which Art founded about 1945. In that year he sold the first Philips unit to Andy Danko and the second to Harold Klug at Mellon. To the best of my knowledge Philips was the first company to have a dealership in the Pittsburgh district.

In 1946 or 1947 Art Pitchford exhibited Philips' historically famous 90° powder diffractometer, which was initially called a spectrometer. A year or so later the General Electric Company introduced its new XRD3 diffractometer at the Conference. Other early exhibitors were Nonius, Chesley, and the Picker X-ray Corporation. . . .

. . . The fifth Conference took place Friday and Saturday, November 7 and 8, 1947. Harold Klug and S. S. Sidhu shared the general chairmanship. Sterling B. Hendricks gave the Friday evening lecture, "Crystal Structure and Lattice Termination in Clays and Related Compounds". This was a large meeting with 203 registrants and 80 served at the Faculty Club dinner. For the first time a European scientist was featured in the regular program. Dorothy Crowfoot (Oxford University) presented a paper entitled "The X-ray Crystallographic Investigation of the Structure of Penicillin". Her success in solving this structure, the most complex organic molecule to that date, won her international renown. . . .

The sixth Conference (1948) held its own claims to distinction. The site was changed to Carnegie Tech, and the general chairman

was Prof. Roman Smoluchowski of the Metals Research Laboratory. A European motif was again accentuated with the Friday evening address by Sir Lawrence Bragg of the Cavendish Laboratory, Cambridge University. His talk was entitled "The X-ray Structure of Proteins and Other Organic Molecules". At this meeting one of the earliest papers on X-ray fluorescent analysis was presented. W. A. Cordovi, of the Babcock and Wilcox Tube Company, spoke on the topic "Quantitative Analysis with the Norelco Fluorescent Analysis Unit". This unit had been designed in part by Art Pitchford. Though the registration was lower this year, 155, there was a record number of 114 at the Friday evening dinner, again at the Pitt Faculty Club.

There was an unfortunate sequel to this conference. After its adjournment Prof. Smoluchowski held a courtesy cocktail party at his house. As the "happy hour" dragged on, Dave Harker suddenly realized that his plane was due to depart in 45 minutes. Bill Cline offered to drive him to the airport. In minutes they were speeding on their way, accompanied by two other out-of-towners, one a G.E. representative. Dave sat in the rear seat. Everyone was in a jocular mood, probably enhanced by the effect of the cocktail party. Just as they pulled up the ramp to the Liberty Bridge, the car ahead stopped abruptly and they rear-ended it with such force that the G.E. man broke the windshield with his head and Dave Harker was catapulted upon the two in front. Miraculously no one was seriously injured, though Bill's chest was sore for a couple weeks from his impact with the steering wheel. Bill flagged down a taxi, which conveyed the other three to the airport in the nick of time for their flight. Hapless Bill Cline was left to settle accounts with the driver of the other vehicle involved.

E. E. Stickley was the general chairman of the seventh Conference (1949). For reasons I have forgotten it was held on Monday and Tuesday, which had the effect of depressing the attendance to 141. Still the meeting had some impressive elements. The Monday evening

address was given by Prof. P. P. Ewald, Chairman of the Department of Physics, Brooklyn Polytechnic Institute. He also had the distinction of being the first editor of *Acta Crystallographica*, Volume 1 of which appeared in 1948. Europe was again represented, this time by Prof. Burgers of the Technological Institute of Delft, The Netherlands. He gave a very interesting paper, "Optical Illustration of Some Geometrical Features of X-ray and Electron Diffraction Patterns". Ray Pepinsky (Penn State) stirred up much excitement with a paper (I believe his first) describing his development of XRAC, an amazing analogue computer for crystal structure analysis. This apparatus was of great historical importance, but unfortunately for Ray Pepinsky it was shortly rendered obsolete by the development and crystallographic programming of high-speed digital computers. Other papers of special significance were presented by W. N. Lipscomb (University of Minnesota) and Isabella Karle (U. S. Naval Research Laboratory).

The eighth Conference (1950) arouses more vivid recollections because I was general chairman. It was the first two-day meeting held on Thursday and Friday, the schedule that was followed until the meetings were expanded to three days beginning in 1956. The eighth Conference had a dominant international flavor. The invited lecturer Thursday evening was André Guinier from the Sorbonne, Paris. His talk was entitled "European Advances in High-Intensity X-ray Diffraction," which was centered on the use of rotating anodes. A special feature of this conference was a Symposium on Small-Angle Scattering, which consisted of papers by Guinier and Fournet (France), Kratky, Porod and Kahovec (Austria), W. W. Beeman (University of Wisconsin), and K. L. Yudowitch.

Mlle. Yvette Cauchois (University of Paris) spoke on "Recent Improvements in Bent-Crystal Techniques with Applications". J. J. Trillat (CNRS, Paris) gave a talk, "Researches by Electron Diffraction on the Cementation of Steel". A paper of historical significance was presented by Howard Evans (Philips Research Laboratories), "Application of a Geiger Counter to Weissenberg Single Crystal Intensities". Other papers of a basic nature were given

by W. F. Bradley (Illinois State Geological Survey), J. T. Norton (MIT), Dan McLachlan (University of Utah), and M. E. Straumanis (University of Missouri, Rolla).

Attendance at this conference was about 190, of which 122, a new high record, were served dinner at the Pitt Faculty Club (the price had escalated to \$3.25). I recall that the crowd overflowed the main dining room, necessitating the seating of a number of diners in an anteroom out of sight of the speakers' table, including, to my dismay, Fankuchen. The affair was enlivened by the locally renowned Westinghouse Male Quartet, who sang several numbers, one tailored for this occasion. Of course the European notables were seated at the speakers' table. Standing out in my memory is a *faux pas* I committed in introducing Mile. Cauchois: "It is my pleasure to introduce a distinguished lady from the University of Paris, Mlle. Cauchois, who is well known for her . . . curves!" The intended words "curved crystal monochromators" had gotten stuck in my throat. General laughter ensued. . . .

Turning to national figures who participated during those earlier years, we may mention first of all Ray Pepinsky, who spoke at most of the meetings from 1946 to 1955. B. E. Warren and his students presented several papers, though I believe only one was given by him personally. He was famed for his lecturing skills. His invited evening presentation in 1945, "Disorder and X-ray Diffuse Scattering," was a model of elegant delivery as well as scientific content. Dave Harker (G.E., and later BPTI) attended many meetings. Aside from his fine talks, his mere presence was an uplifting force on the programs. Dan McLachlan's dry humor always enlivened his scientific presentations. In 1957 his delivery of the evening address, "Crystallography in the Geophysical Year," brought down the house. I. Fankuchen participated quite regularly whether or not he gave a formal talk. To most conferees he was simply "Fan", which in itself characterizes him. Many a conference was buoyed up by his vivacity, boundless enthusiasm, and humor. He loved to pitch in to a free-for-all discussion at the conclusion of a talk. These discussions necessarily drew in several participants and were, in themselves, often very exciting as well as entertaining. The

core group used to sit in the frontrow so as to keep abreast of the action. As something of a novice in those days, I used to regard them with some awe. Among the names that come to mind are Fankuchen, Harker, Pepinsky, McLachlan, and Warren - - to me "The Great Ones".

Underneath a facade of bravado and a degree of garrulousness, Fan was in reality a very sensitive, empathetic human being. He was always appreciative of the efforts of neophytes, and his criticisms of them were lent in kindly terms. In the first few years following World War II, European scientists were often in dire need of the necessities of life. Fan, as head of a CARE Committee for the ASXRED, by June 28, 1948 had raised \$350, which translated into 34 CARE packages for their relief. For some time he continued to raise funds for this humanitarian purpose.

Another scientist conspicuous at many meetings was William (Bill) Parrish, of the North American Philips Company. He promoted Philips (Norelco) equipment with unmatched skill, vigor, and even vehemence. In the late 1940s he and I locked horns a few times in evaluating the virtues and limitations of powder diffractometers. However, over the years we became good friends and developed a healthy respect for each other's points of view.

I must not fail to close on a musical note, especially since it has been one of my own life-long hobbies. Sigmund Weissman, of Rutgers University, was an accomplished pianist with a surprisingly broad repertoire of classical numbers, including some formidable piano concertos. Around the mid-1950s he used to embellish some social hours with some marvelous selections, all from memory.

During this same period, or a little later, Dave Harker could occasionally be induced to grace the keyboard and extract jazz and popular music of the day in his own inimitable self-taught style. Sometimes a group would gather round and sing along. Incidentally, Weissman and Harker were never known to expose their incompatible areas of musical expertise to the invidious comparison of one and the same audience!

Leroy E. Alexander