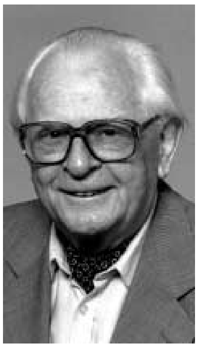
Günther Otto Schenck (1913–2003): A Pioneer of Radiation Chemistry

Günther O. Schenck died on March 25, 2003, in Mülheim an der Ruhr, shortly before his 90th birthday. As a spontaneous response to the sad news, I received numerous expressions in appreciation of Schenck as a scientist, notably also from younger colleagues, who as striving young scientists often used to argue emphatically against Schenck's "Strahlenchemie" (radiation chemistry), particularly when issues such as triplet versus Schenck mechanisms of photosensitization were under debate. Let me cite just three: Samir Farid (Eastman Kodak, Rochester, USA), a former Ph.D. student in Mülheim, wrote: "Schenck will be remembered as a man who influenced the field of photochemistry at a critical time. We owe him a lot of gratitude." Angelo A. Lamola and Nicholas J. Turro, both students of George S. Hammond, one of Schenck's prominent rivals in photochemistry, also expressed their respect. Lamola: "I feel sad because it marks, perhaps, the start of the passing of a great moment in the history of chemistry. … In my discussions and arguments with him, I admired his brilliance and tenacity, and he taught me the value of suspending conclusions while there are possibilities to think about." Finally, Turro: "He was quite a guy!" And this from someone who 30 years ago wrote, "Typically, he has addressed central problems in important areas years before other chemists 'saw the light' and then made use of his anticipative thinking."


Günther O. Schenck

These words refer to the Founding Director (1958) of the "Selbständige Abteilung für Strahlenchemie im Max-Planck-Institut für Kohlenforschung" (Autonomous Department of Radiation Chemistry at the Max Planck Institute of Coal Research) in Mülheim an der Ruhr (Germany), later (1981) to become the Max-Planck-Institut für Strahlenchemie, a center which was soon to be recognized worldwide as a leading multidisciplinary institution in its field, and which was to set standards for Europe. For a rapidly expanding community of photochemists and radiation chemists worldwide, Schenck's "Strahlenchemie" and Mülheim soon became geographical synonyms.

Who was Günther O. Schenck? Born on May 14, 1913, in Lörrach (Germany, just across the border from Basel), he obtained his secondary school diploma (Abitur) in 1932 in Heidelberg. After a short interlude as an apprentice in precision mechanics in Mannheim, he started studying physics at the University of Heidelberg, and subsequently changed to chemistry and physiology. As a chemistry undergraduate and student of Ernst Müller in inorganic chemistry at Freudenberg's institute, he met Hans Kautsky, who taught inorganic chemistry, and who enjoyed discussing his fascinating ideas on luminescence, photosensitized reactions with oxygen, and complex formation of excited states with the young and enthusiastic student. In this period, Schenck also had his first opportunity to meet Karl Ziegler, whose scientific achievements and qualities as a teacher greatly impressed him. After graduating in chemistry (1937), Schenck joined Ziegler, by that time a Full Professor of Chemistry at the University of Halle-Wittenberg (Germany), to take up a Ph.D. project directed toward the synthesis of cantharidin-like compounds. In rapid succession in 1939, he was awarded his Ph.D., married Christel Frommhold, was called to serve for two months in the army upon the outbreak of World War II, and returned to university to finish the first synthesis of the natural product cantharidin. This task was completed by Schenck's first Ph.D. student, E. W. Krockow, in 1941.[1]

The years in Halle proved particularly fruitful scientifically. Schenck was gifted with an extraordinary capacity to unify concepts and information from seemingly unrelated fields and thus derive useful working hypotheses. In this way, based on contemporary insight into photobiology and on Kautsky's theory of oxygen activation, he postulated that molecules such as chlorophyll should be efficient photosensitizers and effect selective oxidation reactions. This concept was promptly demonstrated by an elegant synthesis of the natural endoperoxide ascaridol, through the sensitized photooxidation of α-terpinene, which involved the cycloaddition of oxygen to a diene by using sunlight and spinach leaves (1944).[2] The Schenck reaction, a photosensitized ene reaction with oxygen that affords allylic hydroperoxides, was developed during the same period.[3] In his habilitation thesis (1943), Schenck presented a mechanistic theory for the sensitized photooxidation, which included a hypothetical oxidizing intermediate, $sens^{rad}O_2$. Albeit not entirely correct in the case of the reaction under discussion at the time, the Schenck mechanism of a chemical relay, which accounts for the transfer of an acceptor onto a substrate via a sensitizer–acceptor complex (1948)[4] and was advanced as a visionary general concept prior to the discovery of exciplexes, later proved to be applicable to many physical and chemical processes.

Shortly after the war and before the Russians occupied Halle, a group of scientists including Ziegler and Schenck were rounded up by the US military command and moved to western Germany as part of so-called "Action Paperclip". Schenck stayed with his wife and two children in the home of his mother-in-law in Ziegelhausen near Heidelberg. Until his move in 1949/50 to the University of Göttingen as an Associate Professor, he supported his family by performing first as an accordion soloist, and later as a full-time saxophonist and clarinetist in the "big band" of an old friend and concentration camp survivor, in American clubs. He eventually earned enough money to build a private laboratory and an open-air solar-irradiation pilot plant for the production of ascaridol (see photo on the next page), a drug urgently needed at that time to fight ascaris infections in humans.

The Göttingen period was characterized by continued development of the theory of photosensitization and by a large output of novel photoreactions and their application in synthesis. One such example, which has become a milestone in organic photochemistry, was the sensitized addition of maleic anhydride to benzene.[5] Schenck's unconventional approach to science, his unconditional commitment and forceful argumentation, were respected and accepted by some, and a controversial topic of debate for others. Schenck's

Schenck's solar irradiation setup for the pilot-scale production of ascaridol by methylene-blue-sensitized photooxidation of α-terpinene in isopropanol, in his garden in Heidelberg (1949).

relationship with his teacher, colleague, and life-long supporter Ziegler was that of a personal and professional friendship between two strong-minded characters, which outlasted many a storm throughout three decades. Research funding in Göttingen by the Deutsche Forschungsgemeinschaft (DFG) became available only after a critical and very skeptical Georg Wittig, upon a visit to the applicant's laboratory in Göttingen in his function as a DFG referee, could be convinced of the scientific significance of the grant proposal. In fact, Wittig—with indirect support also from Karl Freudenberg and Wilhelm Klemm—then helped personally to find the optimal formulations! Success with the DFG was thus finally guaranteed, and followed by additional important support from the Fraunhofer Gesellschaft.

In 1958, Schenck moved to Mülheim an der Ruhr, to take up an appointment that had been proposed to the Max Planck Society by Ziegler. He was thus offered the unique opportunity to build up and organize an institute, known as the "Strahlenchemie", for integrated comparative photochemistry and radiation chemistry, with the additional bonus of a symbiosis with the Max Planck Institute of Coal Research, which could be anticipated to be scientifically and economically fruitful for both institutions. And indeed, there Schenck managed to enlarge the experimental pool of novel photochemical reactions and applications thereof even further, started research in radiation chemistry with pulsed Van de Graaff electron accelerators and with a powerful ^{60}Co source of continuous ionizing radiation, and further elaborated on his mechanistic concepts of the chemistry of electronically excited states and of their subsequent ground-state processes.

However, in the middle of the rapid development experienced in radiation-chemistry research, its leader had to slow down and eventually bring to a halt his energetic activities, because of a serious rare autoimmune disease, Hashimoto thyreoiditis. After spending much of 1967 as a Visiting Professor at the Radiation Laboratory of the University of Notre Dame (Indiana, USA), followed by an extended scientific tour in Japan in 1968, he was granted sick leave, and he could not return actively to work at all before his retirement in 1981. Oskar E. Polansky, designated in 1967 as a second Scientific Member at the Strahlenchemie, took office prematurely to ensure the continuous direction of the institute. Fortunately, Schenck recovered sufficiently to resume work in his office at home and, true to his nature, he threw himself into numerous science-related activities until the last year of his life. He concerned himself with philosophical questions ("How certain do we have to be before we accept a theory?") and environmental issues, which led to his involvement in the technical development of water-disinfecting methods by UV irradiation, his unconventional but realistic views on the relative merits of ecology (such as the detrimental influence of flue-gas-dust scrubbing on the state of forest health; "Can ecological protection harm environmental hygiene?"[6]), and his recommendation that CO_2 emissions from the combustion of fossil fuels be reduced by replacement of the latter with charcoal as a carbon dioxide neutral fuel.

Günther O. Schenck's heritage is of lasting value to chemistry and to a large community of former students and coworkers, many of whom have made their own imprint on chemistry, in academia and in industry. Let me end by reiterating the first of the above citations: "We owe him a lot of gratitude!"

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[1] K. Ziegler, G. O. Schenck, E. W. Krokow, *Naturwiss.* **1941**, *29*, 390.
[2] G. O. Schenck, K. Ziegler, *Naturwiss.* **1944**, *32*, 157.
[3] G. O. Schenck, Deutsches Patent Nr. DE-933925, **1955**.
[4] a) G. O. Schenck, *Naturwiss.* **1948**, *5*, 28; b) G. O. Schenck, *Z. Naturforsch. B.* **1948**, *3*, 59.
[5] R. Steinmetz, *Fortschr. Chem. Forsch.* **1967**, *7*, 445.
[6] G. O. Schenck, *Naturwiss. Rundschau* **1990**, *3*, 93.

