

The development of the Story Macrocylic Technology

The development of what became known as "Story Macrocylic Technology" begins in 1966, when Dr. Paul Story accepted the position of Professor of Chemistry at the University of Georgia, Athens. Dr. Story had formerly been employed by Bell Telephone Laboratories, Murray Hill, New Jersey. Clyde E. Bishop met Dr. Story at a seminar given by Dr. Story while at Bell Telephone Laboratories and joined him at the University of Georgia as his first doctoral candidate. Bishop had completed his MS degree at Clemson University, and his doctoral thesis was on the mechanism of ozonolysis.

During the course of Bishop's work on ozonolysis, it became necessary for him to prepare a O^{18} labeled ozonide in order to prove the hypothesis that he had expressed. Another doctoral candidate at Georgia, Donald Denson, was studying the decomposition of acetone diperoxide. Denson was having great difficulty isolating products and completing his doctoral assignment. Bishop suggested to Dr. Story that perhaps Denson should look at the decomposition of cyclohexanone diperoxide. If this work proved fruitful, Bishop could use his work as a source of singlet excited oxygen in order to prepare specifically O^{18} labeled ozonides.

Dr. Story accepted Bishop's suggestion and assigned Denson the project. Denson's results came rapidly. In addition to the excited oxygen, the decomposition reaction produced cyclododecane and the C11 cyclic lactone. Initially, the significance of these other compounds was overlooked. When the importance of Denson's discovery was understood by Bishop, they both set out to prepare cyclohexanone diperoxide in higher yield. During this period they discovered that cyclohexanone triperoxide was the kinetic product and that the diperoxide was the thermodynamic product. This had not been previously noted in the literature. Quite amazingly, the

triperoxide underwent the same ring expansion reaction as previously observed for the diperoxide. This sequence was found to be a quite general reaction sequence leading to a host of macrocylic compounds. This breakthrough uncovered viable routes to the C16 lactone (hexadecanolide) and cyclic C15 hydrocarbons. The C15 hydrocarbons could likewise be converted to a host of known macrocylic musks. When analyzed from a cost basis the reactions provided an amazingly cheap route to macrocylic chemistry. From a scientific viewpoint, it was recognized as a major breakthrough on the work of Dr. Ruzicka, who had received the Nobel Prize for his work on macrocylics in the late 1920s.

Following recognition of the significance of Bishop and Denson's discoveries, all of Dr. Story's abilities and powers as promoter, salesman, and entrepreneur came to the fore. In short order, he had students, other professors, bankers and the community believing in the commercial significance of the discoveries.

In 1968, Uni-Chem Labs was established by Dr. Story. It included facilities to demonstrate the feasibility of the macrocylic process. Bishop left to join Continental Oil Company in Oklahoma, and interested several individuals in investing money in Uni-Chem Labs. One of these individuals, Dr. Carl Kennedy, became a board member. Rapid progress was made in the perfection of the Story Macrocylic Process.

At this point, another interested party, Calgon Corporation, entered the story. Robert O. Carothers of Calgon learned of the development of the Story process and brought the opportunity to the attention of Calgon Corporation. After studying the opportunities, Calgon decided to fund and take a position in the new venture. However, at this point, Merck and Company bought Calgon and effectively terminated any possibility of interest in Uni-Chem.

Meanwhile Uni-Chem was perfecting and scaling up its macrocyclic process. It was heavily in debt with no income and heavy expenses. To protect the potential value of Dr. Story's work based on the patents that had been obtained, Research Corporation of New York brought the results of Uni-Chem to Harry N. Forman, a man with considerable experience in company financing and also with experience in the aroma chemical industry. Forman had entered this industry with Basic Food Materials, a California company that bought the "Gentry" seasonings business from Consolidated Foods in 1967. The company adopted the "Gentry" name, and further expanded by buying the flavor and fragrance business of Magnus, Maybee and Reynard. In 1970, due to sharp differences in policy with the company's owners, Forman left Gentry.

Forman became interested in the company, invested in it, and became president. In 1970, Story Chemical Corporation was founded with a new stock offering. The interest of the investors from Continental Oil Company was bought out. Based on the success of this stock offering, Story Chemical bought Ott Chemical in Muskegon, Michigan from CPC International. Ott was a specialty chemical manufacturer doing \$12,000,000 in annual sales.

An investment of over \$1,000,000 at the Michigan plant site provided facilities for manufacturing the macrocyclic products. An agreement was negotiated with Givaudan Corporation for the exclusive right to market the macrocyclic products produced by Story. Carothers, reentering the picture, joined the company to develop the market for these products.

In 1971, Dr. Story and Forman both moved to Muskegon, Michigan to take an active part in the management of the company. However, difficulties in the scale up of the process plagued the operation, and the procedure of combining Ott operations with the Story development team did not go smoothly. Bishop rejoined the company in 1974 and became director of research.

Problems of financing, raw material supply, and serious pollution problems inherited from Ott continued to plague the operation. The culmination was a bankruptcy proceeding, and the sale of the property in Muskegon to a company not interested in the Story technology. Bishop and Carothers, appreciating the commercial significance of the technology, assembled a business plan representing the technology. With the support of the Research Corporation, they contacted numerous firms and financial institutions about licensing the technology. Albany International's Chemical Division (formerly Chemsampco, Inc.) opted for a license. It will be interesting to see if this technological discovery, with great potential value in aroma chemicals, will finally have a significant effect on the aroma chemical industry.