

Alfred Baber Fonds

Writings

Herbert C. Brown

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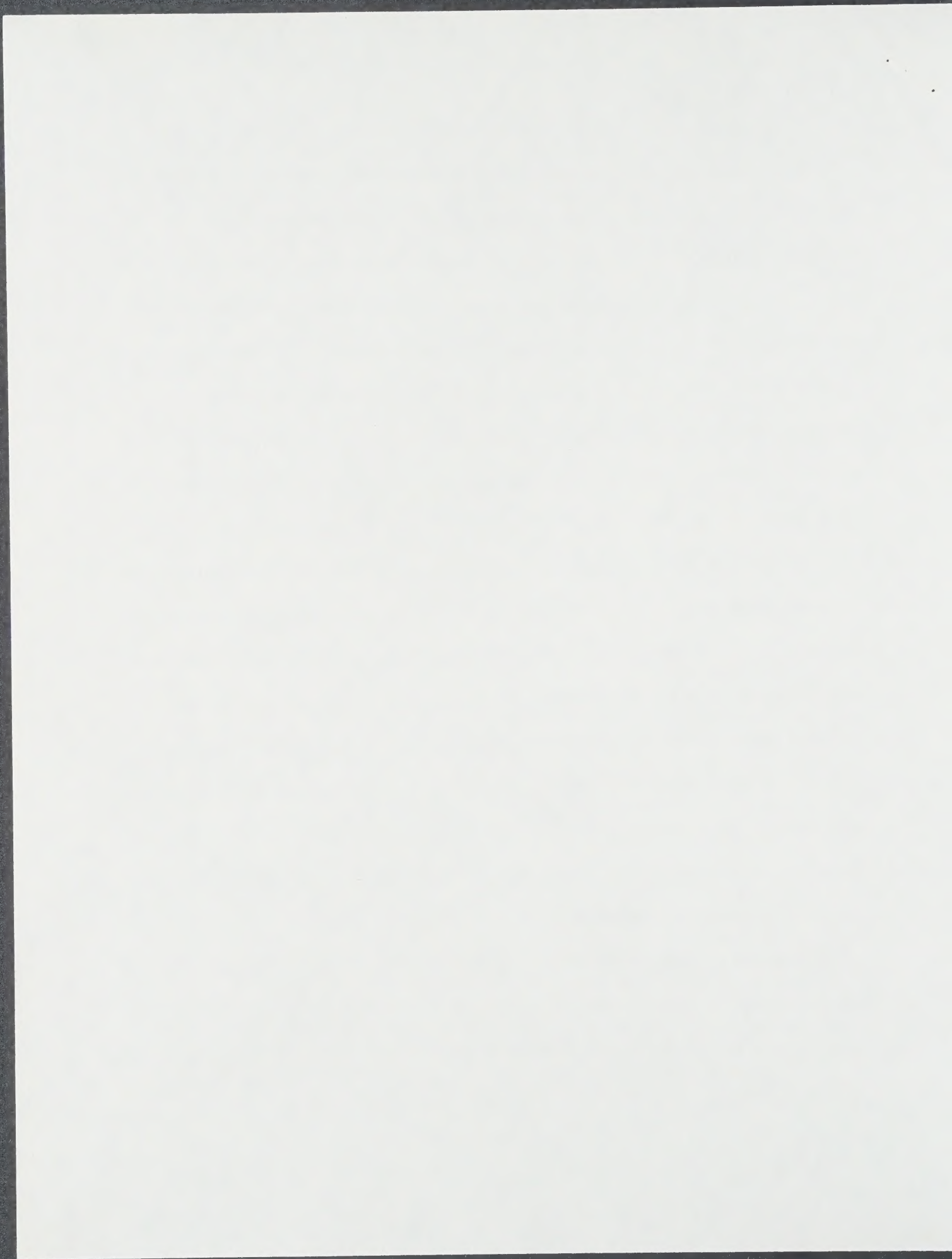
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HERBERT C. BROWN

Long before I met Herbert, I was familiar with some of his papers on the use of boron hydrides for the reduction of organic functional groups. By 1958 Metal Hydrides, Inc., the forerunner of Ventron Inc., had produced the first million pounds of sodium borohydride at its Danvers, Massachusetts plant, to be followed by millions more from the Danvers and Elma, Washington plants. Sodium borohydride was pioneered by Herbert, H. I. Schlesinger and A. E. Finholt at the University of Chicago, and Metal Hydrides had licensed their patents. As Aldrich had a joint venture with Metal Hydrides, ALFA, to sell inorganics, I was of course interested in Metal Hydrides' most important product, and in the man who had developed its many applications, (Herbert C. Brown).

It was from Milton Lauenstein, the president of Ventron, that I received my first impressions of Herbert, the man. Of course, chemists already knew of Herbert's fight with Saul Winstein and Jack Roberts in the classical carbonium controversy. Today, most chemists have forgotten the details of that argument, but remember the heat generated. Derek Davenport has described some details of their fight in the Aldrichimica Acta, 20, 1, 25 (1987), dedicated to H. C. Brown on the occasion of his 75th birthday. Milton Lauenstein often commented on how demanding Herbert was in his patent negotiations, but there was no question about the enormous importance and potential of sodium borohydride and hydroboration, which was recognized most clearly when Herbert received the Nobel Prize for ~~this work~~ ^{CHEMISTRY} in 1979.

It was not until 1972 that I first met the man who was to help us so very much. Herbert had called to ask whether he might visit Aldrich. He wanted our help. He had developed his hydroboration, a technique whereby ~~hundreds of otherwise difficult to make compounds could~~ ^{WHICH MADE IT POSSIBLE TO PREPARE EASILY} ~~make compounds otherwise difficult to make.~~ ^{COMPOUNDS OTHERWISE DIFFICULT TO MAKE.}

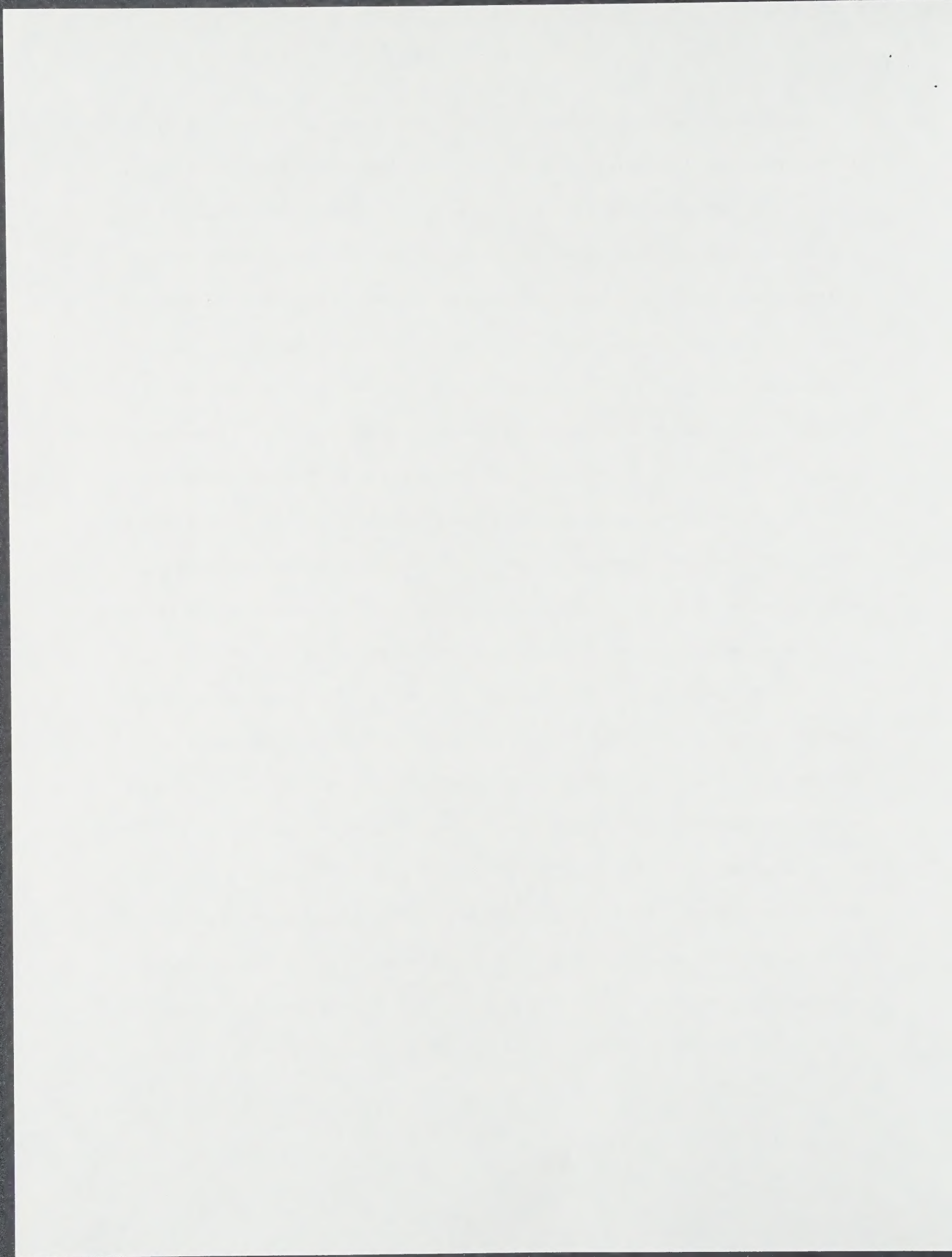


~~be prepared easily.~~ He had suggested to several large companies--Du Pont, Exxon, Searle, Kodak that they start a company to use this technology. Each had shown initial interest, but lost interest when they discovered that there was as yet no million dollar demand for any hydroboration product: "Hundreds of compounds that cannot be made easily otherwise?" I inquired. "Yes, indeed," said HCB. So Marvin Klitsner and I arranged to go to Purdue to spend a day talking to Herbert. By the end of the day we had a handshake agreement that Aldrich would start a wholly owned subsidiary, Aldrich Boranes, with an initial capital of \$250,000, to make hydroboration reagents and products, and that we would pay Herbert a 10% royalty on sales of the first \$2.5 million, 7-1/2% for the next \$2.5 million, and 5% thereafter.

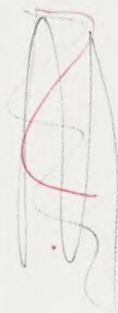
In 1972 we still had a pretty good rapport with Ventron, the sole U.S. manufacturer of sodium borohydride, the key starting material for hydroboration. So I showed the details of this proposed contract to Milton Lauenstein and asked him whether Ventron would like to join Aldrich as an equal partner. His reply was brief, "No, you are paying Herb too much."

We all make mistakes. Milton's decision was one, but few are as serious (and ^{with} ~~in~~ hindsight, as hilarious) as the JACS referees' report in 1956 on Herbert's seminal paper with B. C. Subba Rao on hydroboration (JACS 78, 5694 (1956)): ". . .there is nothing new about the reaction. The fact that the addition of diborane to alkenes takes place in ether solution in a few seconds at zero degrees is a mere convenience. Moreover the reactions produce organoboranes for which there are no known applications. Consequently rejection is recommended."

We could foresee a great future for hydroboration at Aldrich. Following Herbert's suggestion, we hired [✓] one of his able Ph.D. students, (Clinton Lane,) experienced in hydroboration. Clint joined us in September of 1972 and soon he and his assistants were making



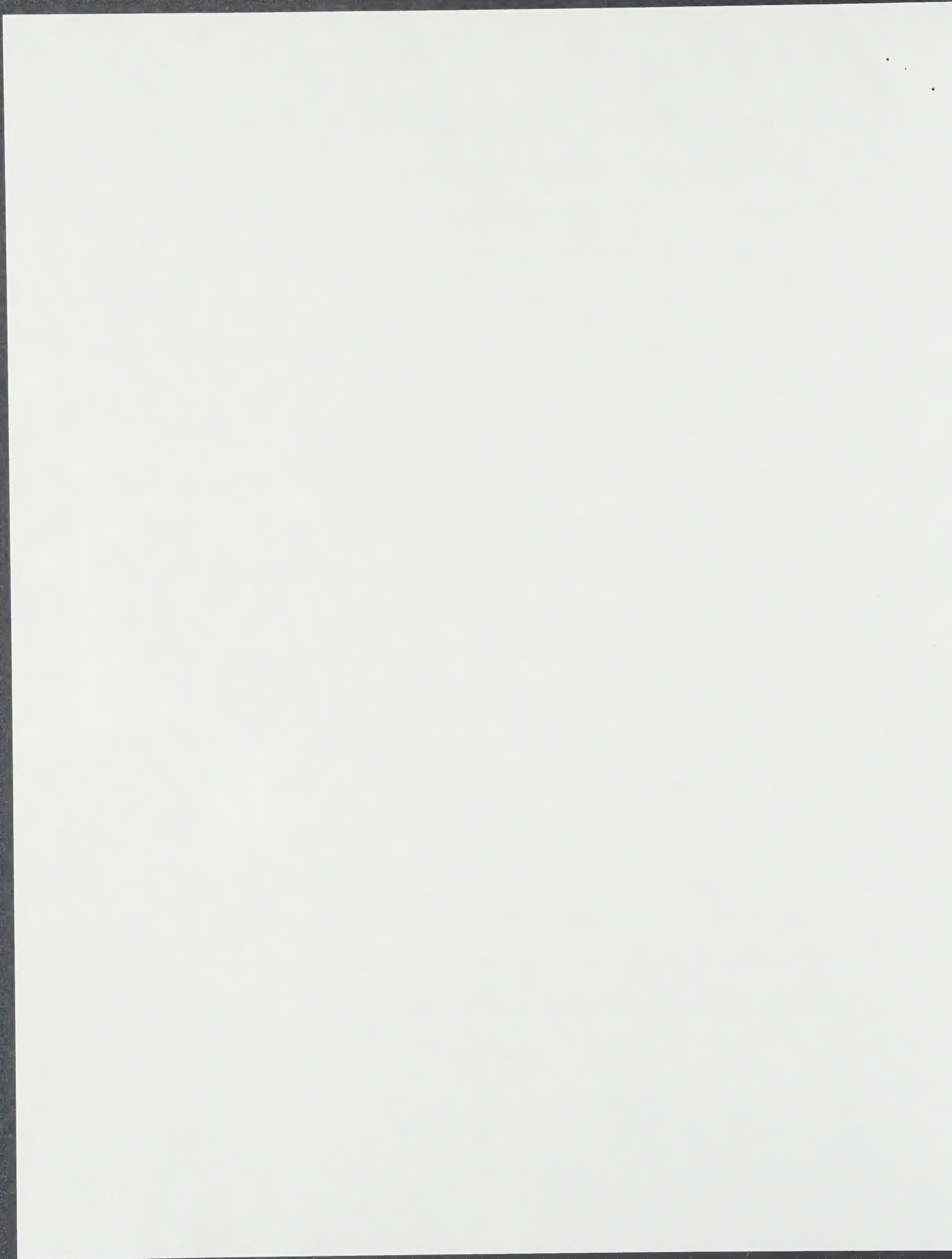
2 hundreds of hydroboration products and reagents. In 1977 Aldrich purchased a chemical plant in rural Sheboygan County, some 50 miles north of Milwaukee, with 140 acres of land, subsequently expanded to 550 acres. (Clint wrote at the time of Herb's 75th birthday celebration, ". . .the true significance of my own situation has finally hit me. Here I am in a chemical plant which will eventually be devoted exclusively to the operations of Aldrich-Boranes, and Aldrich-Boranes is a company organized exclusively to develop the technology discovered by HCB and his research group."



Of course sales of Aldrich-Boranes products have ^{continued to increase} kept going up, and so have Herb's ^{sometimes} royalties, although now only at 5%. In the early years, we had minor disagreements with Herb ~~from time to time~~. These were seldom about details of the contract, more often about our efforts in development--but these disagreements were never serious--nothing like the disagreements Ventron had described.

We greatly expanded the Sheboygan plant, which is now no longer devoted exclusively to Aldrich-Boranes products. One good thing leads to another: once you learn how to handle one highly air-sensitive material like diborane safely, you can handle other air-sensitive materials like the metal alkyls safely, and this we have done. Clint is no longer in charge of the Sheboygan plant, but has become the executive vice president of Aldrich.

Of course we asked Herb to join the Aldrich board of directors in 1972 and then the Sigma-Aldrich board in 1975. However, in 1979, Aaron Fischer and Tom Cori suggested very strongly that Herb should retire from the board; the good reason given was his age. Little did we know that for many years ^{years} after he ~~received the Nobel Prize in that very year~~, he and his



associates would turn out great research work with many new, practical applications. The Nobel

Prize presentation read:

"Herbert C. Brown has systematically studied various boron compounds and their chemical reactions. He has shown how various specific reductions can be carried out using borohydrides. One of the simplest of these, sodium borohydride, has become one of the most used chemical reagents. The organoboranes, which he discovered, have become the most versatile reagents in organic synthesis. The exploitation of their chemistry has led to new methods for rearrangements, for addition to double bonds and for joining carbon atoms to one another."

In April of 1979, in his last letter to the Sigma-Aldrich board, Herb wrote:

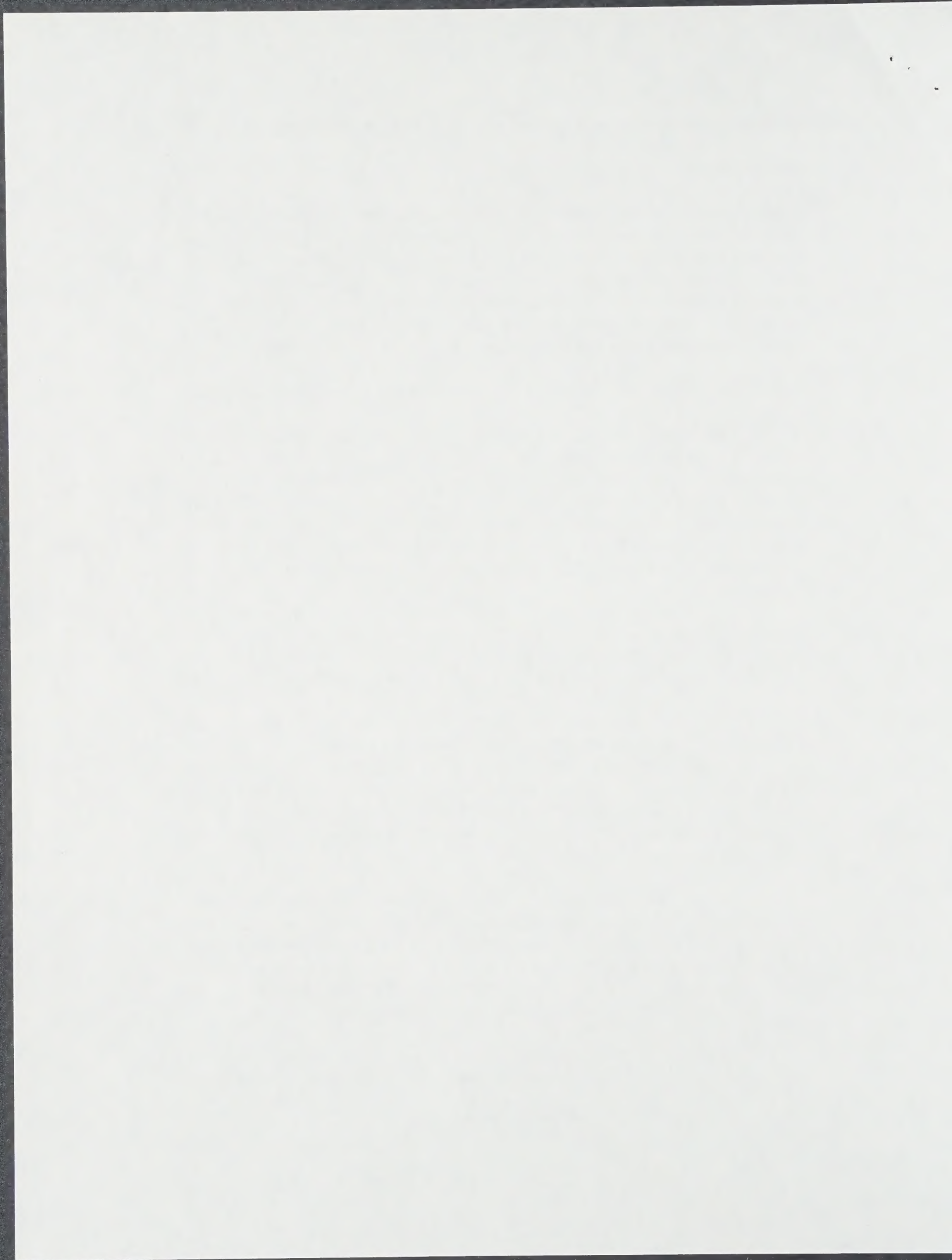
"Over many years my students and I had been exploring a new area of chemistry, that of organoboranes, with major promise in synthesis and chemical manufacture. I tried repeatedly to interest one of the major chemical companies in exploring the possibilities of this area of chemistry, but without success. Company after company expressed interest. They would authorize and pay for a market survey. This would establish that the compounds had not been manufactured or marketed in the past year and they would lose interest.

"Only Alfred Bader showed imagination and courage. After he heard my story, he decided to go ahead to test the market for borane chemistry. As you know, Aldrich-Boranes is doing very well. Sales are far from being market-limiting and are growing as fast as the space, equipment, and personnel permit.

"There are still numerous new developments in chemistry and biochemistry coming out of our research laboratories. Regrettably, our large chemical companies have apparently lost the ability to take such new developments out of the research laboratory into the market place. All too often, developments that had their origin in the research laboratories of the U.S. are today being introduced to the market by industrial organizations in Japan and West Germany, not in the U.S.

"Sigma-Aldrich still has this ability. I believe that organizations which take advantage of these new developments will be far more profitable than those that stay with old, well developed areas. Apart from the greater opportunities for financial return, I believe that the bringing of these new research developments to the market place represents a major contribution to the research workers of the U.S. and a major contribution to the well-being of this country.

When we were discussing taking over the Israel development, there was some questions raised as to whether we might not be spreading our executive



talent out too thinly. It may be that we are. If so, I hope that you will make a major effort to add to our executive capabilities and will continue to expand Sigma-Aldrich's capacity to bring new research developments to the market place and to emphasize that function.

"This is an area where we can be idealistic while greatly improving the financial prospects for Sigma-Aldrich."

Purdue honored HCB on his 70th, 75th and 80th birthdays, and we were happy to be able to help with exhibits of old master paintings at Purdue. His great work continues, and we look forward to celebrating his next milestone.

