December 11, 1963

Professor Henry Eyring
Dean of the Graduate School
University of Utah
Salt Lake City, Utah

Dear Dean:

I appreciate your interest in nominating me for membership in the National Academy of Science, and in accordance with your suggestion a enclosing a brief biographical sketch and list of publications and patents.

Perhaps my major scientific achievement was the synthesis of diamonds on the 16th of December 1954. Prior to this, scientists had spent at least 125 years trying to obtain a clear-cut, unequivocal synthesis. My synthesis may not have been the first. Sam Kistler says he made diamonds at the Norton Co. prior to 1954 (no details have ever been published). Herbert M. Strong of General Electric claimed a synthesis on the 8th of December 1954 although this synthesis has never been reproduced by Strong or others. The Swedish group at Vasteras (A. S. E. A. ) claims to have synthesized diamonds in February 1953. However, details concerning this synthesis were not published until after the G. E. release of details. Despite these claims, rr.y synthesis stands out as a landmark for the following reasons:

(a) The synthesis was reproducible by myself and others.

(b) Diamond growth was very rapid (two or three minutes to completion).

(c) Diamond yields were significant--outstripping a million fold the concentration relative to the growing matrix of diamonds found in nature.

(d) The diamonds, though tiny, (triangular crystal faces were up to 300 microns on edge) could be observed with the unaided eye and were obtained in sufficient quantity to be "felt" and held in the hand.

The reproducibility, rapid growth and yield of my synthesis immediately opened the door to commerical production, (see paper no. 26 in bibliography)

An achievement closely related to the diamond synthesis was my design and development of the "Belt" apparatus in 1953 (paper no. 21). This was the first apparatus capable of sustaining pressures of 100, 000 atmospheres magnitude simultaneously with high temperatures. This apparatus represented a "quantum-jump" above anything available previously, and of course, made the diamond synthesis possible.

Because of General Electric's proprietory interest (complicated later by government secrecy), details concerning the "Belt" were kept secret for seven years. I could not use the "Belt" after leaving G. E. in 1955 and, consequently, was obliged to devise another apparatus: the "Tetrahedral Anvil Press", which has the same pressure-temperature capabilities as the "Belt". Details of the Tetrahedral Press were published in April of 1953 (paper no. 15). This publication, and articles written for Science and Scientific American (papers nos. 16 and 19), together with the knowledge that diamonds had been synthesized, aroused a strong interest in high pressure research.

Ever since 1956 scientists from all over the world have come to Brigham Young University at a rate exceeding fifty per year to discuss high pressure research. In addition, countless telephone calls and letters requesting information on high pressure have been answered. There are now over 150 laboratories throughout the world engaged in high pressure research and, with few exceptions, researchers from these laboratories have come to Provo for advice.

Some additional achievements follow:

The first melting point measurements at extremely high pressures (the melting point of germanium, 1955, paper no. 10).

The first x-ray diffraction measurements at high pressure simultaneously with high temperature (in collaboration with J. Dean Barnett and Roy B. Bennion, paper no. 32).

The first observation of a pressure-induced transition from a close packed to a non-close packed structure (in collaboration with J. Dean Barnett and Leo Merrill, paper no. 28).

The development of apparatus capable of exploring hitherto unavailable regions is time consuming. For example, Dr. J. Dean Barnett and I have spent four years in developing a tetrahedral press capable of making x-ray diffraction measurements under simultaneous high pressure-high temperature conditions (Rev. Sci. Instr., in press). Once developed, a new instrument provides opportunity for many researchers to explore all sorts of phenomena in the formerly inaccessible area.

I hope the above will be of use in making the nomination. If additional information is desirable, I will be happy to supply it.

Best personal regards.

Very truly yours,

H. Tracy Hall Director of
Research Room 224 ELB

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