CARNEGIE INSTITUTION OF WASHINGTON

GEOPHYSICAL LABORATORY

5251 Broad Branch Road, N. W., WASHINGTON, D. C. 20015-1305
[202] 686-2410 (x2470) [202] 686-2419(FAX)

February 14, 1997

Dr. Charles E. Blue
Charles Stark Draper Prize, NAE
NAS-069
2101 Constitution Ave., NW
Washington, DC 20418

Dear Dr. Blue:

It is my great pleasure to support the nomination of Dr. Tracy Hall for the Charles Stark Draper Prize. Dr. Hall, who was the first person to synthesize diamonds in a reproduceable, commercially viable method, is eminently deserving of this recognition.

For the last twenty years I have been a high-pressure researcher at the Geophysical Laboratory of the Carnegie Institution. In our field, the work of Tracy Hall and his General Electric colleagues Francis Bundy, Herb Strong, and Robert Wentorff in making diamonds in giant presses is legendary. I first met Tracy Hall while doing research on a book on the history of high-pressure research (*The New Alchemists*, Doubleday, 1993). Hall, along with many of his former coworkers at General Electric, provided the primary sources for much of the book.

The history proved to be complicated, and was made more difficult by an entrenched GE corporate mythology that teamwork led to diamond synthesis, and that Herb Strong conducted the first successful experiments. This "first man-made diamond," which was enshrined in the GE corporate museum, was recently shown to be a natural fragment. Everyone concerned now agrees that Tracy Hall made the first successful run. Please see extensive details of this important history in my book a copy of which should be part of Hall's nomination documents.

To summarize Hall's remarkable accomplishments, he (1) designed the first and most successful diamond-making press, the belt apparatus; (2) he used that device to synthesize the first GE diamonds; (3) he invented the tetrahedral anvil press and repeated his diamond-making success at BYU; (4) he made significant improvements in the cube-anvil press, and applied that device to producing sintered diamonds. These advances are now the basis for virtually all diamond abrasive synthesis, and they have led to extraordinary technologies, previously undreamed.

First and foremost, Hall's techniques are used in virtually all diamond abrasive synthesis. More than 100 tons of diamond abrasives (more than have been mined in human history) are now produced *every year*. This multi-billion dollar industry provides cheap and reliable abrasives that affect our lives in many ways. Eye glasses once took weeks to order, but now are available in an hour. Road repairs once required destructive and noisy jackhammers, but now roads can be repaired with surgical precision using diamond saws. Reinforced concrete structures, including dams and power plants, can now be modified with ease. Diamond machine tools are vital to national security, in the machining of high-tech carbide components. They also find myriad uses in faster and cheaper manufacturing of automobiles, appliances, aircraft, and other products. Synthetic diamonds enhance our lives in many other subtle ways. A wonderful variety of polished ornamental stones, including hard and durable rocks such as granite, are now cheap and commonplace. And synthetic diamonds also make dental work faster and safer. Countless jobs and billions of dollars of American productivity are a direct result of Tracy Hall's discoveries.

Finally, I must insert a personal note. Hall's advances have played a major role in high-pressure science. His designs for high-pressure devices are still widely used and have led to many fundamental discoveries about the nature of the earth's deep interior. The belt idea, furthermore, has been incorporated into the widely-used diamond anvil cell, which has pushed the frontiers of high-pressure research to millions of atmospheres. All high-pressure scientists are in Tracy Hall's debt.

At the time of Hall's breakthrough in 1954, diamond synthesis was a Holy Grail of chemistry. Several famous scientists, including Nobel laureates Percy Bridgman and Frederick-Henri Moissan, had tried and failed. Had GE nominated Tracy Hall for the Nobel Prize, many of his peers believe that he stood a very strong chance of winning. GE, however, pushed the teamwork concept and claimed that four men should share equal credit. (Nobel Prizes can go to no more than three.) While Bundy, Strong, and Wentorf played key roles in the GE effort, there can be no doubt that Tracy Hall's contribution was most central to the group's success.

The Draper Prize would be a fitting tribute to Tracy Hall.

Sincerely,

Robert M. Hazen

RMH/tex