GENERAL ELECTRIC
Research Laboratory
SCHENECTADY, NEW YORK

PUBLIC INFORMATION UNIT

Herbert B. Nichols

PHOTO ORDER ATTACHED

FOR RELEASE AFTER 10:30 a.m., E.S.T., FEBRUARY 15, 1955

G-E SCIENTISTS MAKE DIAMONDS IN THE LABORATORY

SCHENECTADY, N.Y., February 15--Man-made diamonds, the climax to a 125-year effort to duplicate nature's hardest and most glamorous substance, were displayed here today.

Scientists of the General Electric Research Laboratory exhibited tiny diamonds made from a carbonaceous material subjected to extreme pressures and temperatures. The largest stone, which measured 1/16 of an inch in longest dimension, was presented to Ralph J. Cordiner, president of General Electric Company, by Dr. C. Guy Suits, G-E vice president and director of research.

In announcing what he termed "one of the landmarks in man's search for knowledge about his world," Dr. Suits warned that "any conclusion we are about to make diamonds of a size and quality suit-

-more-

able for gem use is decidedly premature." Diamonds for jewelry must have special characteristics of size, color, and crystal perfection.

"On the other hand," he added, "if the present high cost of making diamonds by the G-E processes can be reduced, the primary application of man-made diamonds will probably be in industrial tools for cutting and polishing." Diamonds of any quality, regardless of size and color - including diamond dust - are useful in industry. The crystals displayed here today are not "imitation" diamonds or "diamond-like." They are purely and simply diamonds, exactly the same as are taken from mines of the Belgian Congo and Brazil.

The hardest substance known to man, diamonds are mined at the rate of about 2-1/2 tons annually. Approximately 90 per cent are imported by the United States. Of the diamonds of industrial grade, some are stockpiled for defense purposes, but the major portion goes into tools that cut, saw, or polish other hard materials. For industrial diamonds purchased in a typical year, the U.S. paid more than $50,000,000.

According to Dr. A. L. Marshall, manager of the Laboratory's Chemistry Department, the G-E diamonds were positively identified by x-ray inspection, chemical examination, and hardness tests. Under hardness tests, the G-E diamonds proved capable of scratching anything, even other diamonds.

Thus the G-E diamonds are the first man-made substance to scratch other diamonds.

Making diamonds was the result of more than four years of intensive research by Laboratory scientists under supervision of Anthony J. Nerad, manager of the Mechanical Investigations Section. "G-E's success was no accident," he said, "but a part of a general program for examining various materials subjected to combined high temperature and pressure."

The scientists responsible for the project were Drs. Francis P. Bundy, H. Tracy Hall, Herbert M. Strong, and Robert Wentorf.

In Dr. Strong's process, a carbonaceous compound was subjected for many hours to a measured pressure some 53,500 times greater than atmospheric (roughly 800,000 pounds per square inch). That run, in the Laboratory's new 1000-ton press, yielded a crystal nearly a sixteenth of an inch in longest dimension.

"After opening the pressure chamber," said Dr. Strong, " and while attempting to polish the now solidified matrix, there appeared what we were seeking, a core of superhard matter that refused to wear away under the action of the polishing wheel. With considerable excitement and expectation I removed the crystal from its surroundings, and tried one of its sharp points on sapphire, silicon carbide, and boron carbide. This 'diamond', I could call it now, easily scratched all three."

Of fundamental importance was the work of Dr. Hall, who extended Bundy's initial high-pressure work and developed the "belt," a chamber enabling G-E scientists to maintain for the first time temperatures above 5000 degrees Fahrenheit at pressures in excess of 1,500,000 pounds per square inch.

This pressure is roughly equivalent to the "squeeze" physical scientists have computed for points 240 miles beneath the earth's surface. Using this equipment, late last year Dr. Hall developed a process that produces diamonds in a matter of minutes. Hall's diamonds are smaller, but are often produced in solid clusters. Single runs have produced up to 1/10 of a carat.

Dr. Wentorf likewise had success with the same physical apparatus employed by Hall, though different chemical conditions were present. Since these achievements, several new methods have been tried, and these also produce diamonds.

Today, members of the press saw the equipment in operation making diamonds by the Hall and Wentorf processes. The many variations of color, clarity, and crystallinity found in natural diamonds have been observed in the G-E man-made crystals.

To confirm the results two independent teams of scientists from other departments in the Laboratory have repeated the experiments of Hall and Wentorf, in each case with success. All in all, the various processes for making diamonds have been repeated successfully more than 100 times.

Many of the first diamonds produced were deliberately destroyed during essential testing. For example, many crystals had to be burned to determine their carbon content.

Dr. Marshall, in the course of discussing laboratory tests for diamonds, explained that x-ray examination is perhaps the most conclusive single test, because every crystal from common salt to

precious jewel has its own distinctive x-ray "fingerprint," or diffraction pattern. It is easy to recognize the pattern of diamond because no other known material comes anywhere near matching it.

General Electric attaches great importance to the possibility of producing diamonds as a logical extension of its interest in hard cutting materials represented by cemented carbides produced in its Carboloy Department.

The true status of previous attempts to make diamonds is difficult to determine with certainty. Principal claimants of success were a Frenchman, C. Cayniard de la Tour (1828); an English experimenter by the name of Hannay (1880); the French scientist H. Moissan (1894); and a British scientist, Sir Charles Parsons (1907-1920), who subsequently expressed doubt about his own results.

Repeated attempts by many researchers to reproduce the results claimed by these earlier investigators have failed, and careful analyses of existing records by reputable scientists have not confirmed any previous claims that diamonds were actually produced in the laboratory.

Professor N.V. Sidgwick of Oxford University, reviewing the evidence in his two-volume work Chemical Elements and Their Compounds (1950), concludes "The artificial production of diamonds has never been a success." He goes on to say that fundamental calculations make it very improbable that any of the efforts so far to produce diamonds have succeeded.

Certainly no sure method of repeatedly making diamonds has ever been announced before today.

In perfecting the long series of laboratory improvements in their struggles to achieve combined high pressure and high temperature, G-E scientists gained valuable help from nature, particularly from studies of diamonds found in Arizona meteorites.

Knowledge of pressures reached was gained by observing changes in the electrical resistance of bismuth, thallium, cesium, and barium--phenomena discovered by Dr. Percy Bridgman of Harvard University, world-renowned pioneer in high-pressure research.

--30--

PHOTO ORDER

Herbert B. Nichols
Public Information
General Electric Research Laboratory
Schenectady, New York

To illustrate your news release concerning man-made diamonds, please send me the following photographs:

1) _____ Dr. C. Guy Suits examining photomicrographs of diamonds made in the General Electric Research Laboratory by processes discovered by Dr. Herbert Strong (left) and Dr. Tracy Hall.

2) _____ General Electric Research Laboratory's 1000-ton press for achieving high pressures.

3) _____ The Research Laboratory team of scientists responsible for high pressure studies.

4) _____ Dr. Francis Bundy at controls of G-E's 1000-ton press (vertical)

5) _____ Dr. Francis Bundy at controls of G-E's 1000-ton press (horizontal)

6) _____ Hall & Wentorf working out a problem concerning the "belt," a high temperature - high pressure chamber which Hall developed.

7) _____ Hall examining a small diamond-containing capsule removed from a recent high-temperature - high pressure run.

8) _____ Strong & Cheney at the business end of G-E's new 1000-ton press.

9) _____ Largest diamond yet made in the G-E Research Lab, shown alongside a standard, diamond, high-fidelity phonograph needle.

10) _____ Photomicrographs of diamonds made by the Hall-Wentorf process.

11) _____ Photomicrographs of diamonds made by the Hall-Wentorf process.

12) _____ Grinding and polishing tools illustrating some of the uses for industrial diamonds.

13) _____ X-ray diffraction patterns of natural and man-made diamonds.

_____
Name

_____
Publication

_____
Address