

CLIFFORD B. BRANAN, JR.

Petroleum Geologist

OKLAHOMA CITY 18, OKLAHOMA

November 10, 1959

SHARTEL CENTER

5225 N. SHARTEL • P. O. BOX 9561

Victor 2-2104 • Victor 3-0490

Mr. H. Tracy Hall
Director of Research
Chemistry Department
Brigham Young University
Provo, Utah

Dear Sir:

I would like to say that your article "Ultrahigh Pressures" in last months Scientific American was one of the finest I have ever had the pleasure to read. It is a classic in my opinion, and deals with a great new frontier in science.

I would like to take issue with you on your opening statement about "man being able to hit the moon before he sunk a shaft three miles in the ground". There are literally dozens of wells in the United States alone, more than three miles deep, not to mention South America, Iran and the U.S.S.R. In fact the three mile limit was drilled to in Oklahoma twelve years ago. Here are a few examples.

— Superior No. 1 Weller	1947	17,823'
— Denver No. 1 School Land	1948	16,800'
— Shell No. 5 Rumberger	1958	24,002'

I am not sure but I think the 15,840' (3 miles) level was reached in Wyoming by Superior Oil Company and in California by Ohio Oil Company before 1947.

On the Gulf Coast and in West Texas there are a number of wells in the 4 mile range. The deepest well in the world was drilled last year in West Texas. It is the Phillips No. 1 E.E. University. Total depth was ~~22,575'~~ 15,340'. Approx 4³/₄ miles.

You mentioned something I have been unable to dig out in the literature, that I am anxious to find out about and in hope you can tell me. Is it possible to freeze water under pressure so that it does not expand? If so, how many atmospheres and what temperature does it require to do so? Would it be "ice" if it is possible to do this? Will it disintegrate if the containing vessel is removed?

It might be of interest to you to know that most of these deep wells I have mentioned had cores removed from total depth. I am sure these concerns would be happy to provide you with the pressures and temperatures encountered. Some rather interesting things happen when cores are pulled from extreme depth.

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Page 2

November 13, 1959

Mr. H. Tracy Hall
Provo, Utah

Wishing you the greatest success in your further work,
I am

Yours very truly,

C. B. Branan
C. B. Branan, Jr.
Petroleum Geologist

CBB/erl

I also appreciate your directing attention to my
regard to the depth of the shafts that man has drilled in
and I certainly appreciate obtaining the well-depth information that
is included in your letter.

In regard to your question, "Is it possible to freeze water
under pressure so that it does not expand", the answer is yes. At
a pressure of about 200,000 atmospheres, at room temperature,
a new form of ice forms known as Ice II. This material freezes with-
out expanding. As a matter of fact, it contracts on freezing.
Furthermore, as pressure is increased, additional ices are en-
countered so that within the pressure range from 1 atmosphere
to 10,000 atmospheres, five different ices are known. Four of
these ices contract on freezing. In the instance of Ice II, it has
been possible to prepare the material at a low temperature and
drop the ice in a glass of water where it promptly sinks and slowly
dissolves. It will cool the water just as normal ice.

Very truly yours,

H. Tracy Hall
Director of Research

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HTNSW

SCIENTIFIC
AMERICAN

435 MADISON AVENUE, NEW YORK 17, N. Y. MURRAY HILL 8-3900

November 13, 1959

September 11, 1959

Mr. C.B. Branan, Jr
Petroleum Geologist
Shartel Center
P.O. Box 9561
Oklahoma City 18, Oklahoma

Dear Mr. Branan:

Thank you for your letter of November 10 expressing an interest in our high pressure, high temperature research. I very much appreciate your kind comments concerning the Scientific American article.

I also appreciate your directing attention to my error in regard to the depth of the shafts that man has drilled in the earth, and I certainly appreciate obtaining the well-depth information that you included in your letter.

In regard to your question, "Is it possible to freeze water under pressure so that it does not expand", the answer is yes. At a pressure of about 200,000 atmospheres, at room temperature, a new form of ice forms known as Ice II. This material freezes without expanding. As a matter of fact, it contracts on freezing. Furthermore, as pressure is increased, additional ices are encountered so that within the pressure range from 1 atmosphere to 40,000 atmospheres, five different ices are known. Four of these ices contract on freezing. In the instance of Ice II, it has been possible to prepare the material at a low temperature and drop the ice in a glass of water where it promptly sinks and slowly dissolves. It will cool the water just as normal ice.

Very truly yours,

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H. Tracy Hall
Director of Research

HTH:lw