

a very viscous liquid with properties of a solid. As Dr. B. J. Luyet of St. Louis University has shown, watery solutions of substances made up of large molecules can be vitrified readily by sufficiently rapid passage through a temperature range of some 30 to 40 degrees Centigrade below the freezing point of water. Under these conditions life is not necessarily disrupted. The stuff in some small living cells can be vitrified by plunging into liquid air, dropping their temperature 200 degrees per second, so fast that ice has not time to form. Their physiological time virtually stands still at very low temperatures. Warm them rapidly and they are restored to normal living.

### Others Had Experimented

The literature showed that for one reason or another (without visualizing the "time machine" idea) many other research workers had experimented with life at low temperatures. Dr. Luyet with P. M. Gehenio published a book last year on "Life and Death at Low Temperatures." Other scientists, as well, showed that a great variety of small living organisms survive rapid cooling and subsequent rapid warming. Dr. W. Stiles was the first to show the importance of rapid cooling and warming in making possible a state of suspended animation. Most important, the length of time endured in the vitreous state of most of the organisms studied seems to have no effect on the percentage of organisms reviving. Dr. L. B. Shettles of Johns Hopkins University vitrified and revived a very small percentage of the male human reproductive cells, sperm, and Dr. Luyet had earlier demonstrated this for frog sperm. Cells once vitrified may be kept safely in storage at temperatures only 30 to 40 degrees below zero Centigrade.

If man himself cannot take the journey into the future, he may be able to send his immediate sons. That is the way that Dr. Hoagland reasoned. He and Dr. Pincus set to work. They confirmed Dr. Shettles' finding that human sperm survive immersion in liquid nitrogen at 195 degrees below zero Centigrade. With improved technique and treatment, they succeeded in reviving 30 to 40 per cent of the sperm given this frigid treatment. They also have been able to revive a small percentage of similarly treated rabbit and bull sperm, although human sperm withstands the treatment better than those of other mammals studied. The fertilizing ability of revived sperm is yet to be proved, although this seems most probable.

The "time machine" is about ready to be given a test run. The parts are ready.

Just as the first experiments will be upon lower animals, such as guinea pigs, rabbits and cattle (for such is the way of science), the practical application will be made first to animal breeding.

Artificial insemination is a growing practice in animal husbandry, but under present conditions the male reproductive cells cannot be kept in storage for more than four days. If the new vitrification method proves practical, a great horse-like Man o' War could have immediate sons many generations after his death. Dr. Hoagland suggests that through this method of stored germ plasm prize stock could be renewed years in the future even if faulty breeding allows it to degenerate.

Suppose these things had been known in the time of Socrates or Shakespeare or Newton. Their sons might be walking among us, mothered by virtuous females enamored of the past.

More frequently than the public knows, couples who otherwise would be childless call upon medical skill to give them the pleasures of parenthood. The biological father in such cases remains a remote and anonymous donor.

Dr. Hoagland, more or less humorous-

ly, has suggested the possibility that his biologic time machine, social sanctions permitting, might allow a part of each generation of the future to be fathered by the truly great men of the past, whose genius and qualities have stood the test of history.

In a disordered world bent on human destruction, profligate with life, it would be genetic insurance for the future if we could set up storehouses of precious human germ plasm. Our sons and daughters of a few centuries hence might value this inheritance more than all the gold at Fort Knox.

*Science News Letter, April 26, 1941*

Clerks in the Middle Ages, who slipped English words into their account books when they could not think of the Latin, have provided editors of a Middle English Dictionary several thousand English words for objects, tools, and farming and industrial operations.

Trees ten inches in diameter should stand ten feet apart, says a forestry specialist, citing a general rule that, for free growth, trees may well be allowed as many feet of distance apart as the stem diameter of the trees in inches.



### FUTURAMA

Visitors to the 1940 New York World's Fair, who stood in a long line for an hour or so to look at the famous "Futurama" will be glad to learn that the Futurama is to appear in a smaller edition at the New York Museum of Science and Industry. Many of the original objects for the World's Fair exhibit are retained in the Museum's display. Visitors will not be able to sit in those nice moving chairs, but neither will they have to wait in line.