THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

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QUARTZ WINDOWS WILL LET ALL THE SUNSHINE IN

Real sunshine indoors is the possibility held out by Dr. Edward R. Berry, assistant director of the Thomson Research Laboratory of the General Electric Co., Lynn, Mass. as the result of the perfection of a process for making fused quartz. Glass windows keep out the healing and stimulating ultra-violet rays of sunshine. Quartz, or rock crystal, lets them through; and if windows were made of quartz, people could enjoy indoors exactly the same sunshine they would get under the open sky.

The results of Dr. Berry's researches were briefly announced at a recent meeting of the American Philosophical Society in Philadelphia.

Rock crystal has been known from ancient times, and that it can be fused has been known nearly 100 years. but Dr. Berry is the first to develop a practicable method, suitable for development into commercial applications although development in that direction has been limited so far. The trick is in the use of a special type of electric furnace for the melting of the quartz, in which the heat is furnished by the electrical resistanceof a carbon cylinder, within which the graphite crucible is contained.

The raw material is rock crystal of high purity, and this is melted in the furnace under much reduced atmospheric pressure so as to remove the maximum amount of air and other impurities. The fused quartz, at a temperature of close to 2,000 degrees Centigrade, or about 3,600 degrees Fahrenheit, is the n squeezed out through holes either by pressure or its own weight and formed into rods or tubes, or it is cast into blocks or other shapes desired. Blocks a foot long and several inches thick were exhibited.

Possible applications of this new product may be seen from a recital of some of its more important characteristics. First, it transmits light almost completely without shutting off either the life-giving ultra-violet or the heat-giving infra-red rays. It makes easily possible the medical use of ultra-violet light either by indoor exposure to sunshine, or by the use of mercury vapor lights in quartz bulbs. Light travels down a rod of quartz much as water down a tube. Little is reflected out of the sides. So it is possible to put a source of ultra-violet light at one end of a small glass tube or rod, and transmit it almost unimpaired to the interior of the body. Ultra-violet light has been known to be fatal to the germs which cause such diseases as pyorrhea, nasal infections, and similar morbid conditions, and the light can be turned on just where it is needed.

Fused quartz can be heated to bright red heat and then plunged into ice water without cracking or injury of any sort. This is because it expands so little with heat, only .6 of a thousandth part of its length for a rise of 1,000

degrees Centigrade. This makes it valuable for use in telescope lenses, or in the projection lenses for motion pictures where the lenses are exposed to great heat from the electric light. Quartz lenses are already being used in movie theaters.

More accurate thermometers may be made of fused quartz than of glass. Dr. Berry took a glass thermometer and a quartz one, heated them both nearly to redness and then cooled them to the temperature of ice water, with the result that quartz instrument was still accurate while the one made of glass showed big errors.

Quartz is silicon dioxide of which a large part of the crust of the earth is composed, but so far it has not been found practicable to make the fused quartz from anything but rock crystal, which, however, is fairly aboundant and cheap. To make the highest quality of optical quartz it is necessary to remelt the quartz under a pressure of about 600 pounds. This compresses any bubbles remaining in it so as to make them of insignificant size. This quality has not as yet been placed on a commercial basis, Dr. Berry said.

But as to the ultimate outcome, he was decidedly optimistic.

" I believe that eventually everything now made of glass may be made from quartz," he said.

As for the immediate future, Dr. Berry exhibited a block of fused quartz a foot long, which will be sawed by diamond saws into window panes for use in a children's clinic in a large hospital. The ultra-violet rays of sunshine cure rickets and tuberculosis, and the quartz panes will let all the sunshine in to the bodies of the children without exposing them to the chill of outdoors.

MODERATE USE OF ALCOHOL LENGTHENS LIFE, STATISTICS SHOW

Moderate and steady drinkers of alcohol have a better expectation of life at all ages from 30 to the end of the life span than do total abstainers, Dr. Raymond Pearl, chief of the department of biometry and vital statistics of the Johns Hopkins University has reported to the National Academy of Sciences.

Dr. Pearl based his statement on complete life tables calculated in precisely the same manner that all insurance tables based upon actual experience of the insured are calculated. These tables, which are the first ever made, are based on the data which include exact records as to the drinking habits of thousands of people throughout their lives, including over 150,000 person-years exposure to risk.

" The differences are not very great between the moderate, steady drinkers and the total abstainers, but there is a distinct and well-marked advantage in favor of the moderate, steady drinkers," said Dr. Pearl.

"Heavy drinkers have the poorest expectation of life at all ages after 30 in the case of females, and at all ages after 30 and up to about 65 in the case of males. From about 65 on the heavy drinking males and the total abstaining males have about the same expectation.

"T hese conclusions are drawn from what is demonstrably the most critically adequate material, considering both quality and quantity, whi ch has ever been available for the study of the problem of the influence of alcohol upon the duration of human life. Comparison with the official United States life tables shows that the experience dealt with in this study is actuarially entirely normal. That is, the persons included in it are not significaly super-standard or sub-standard life insurance risks. They are just normal, average people."

SIMPLE SCIENCE

By WOW

MATCHES

There are many kinds of matches. Some are more striking than others, especially the kind made by interested and bestirring relatives. The first lucifer was made by an Englishman in 1827. Today there are many match factories, but it's a "light" business.

The ancients used to get a light by rubbing two dry sticks together. The first fire was probably produced by lightning stricking a tree. Later on flint and steel were used. These methods were very inconvenient, so the habit of smoking probably developed very slowly at this time.

About 1825 a Frenchman made a match out of sugar, gum and potassium chlorate stuck on a piece of wood. By dipping this into a bottle of oil of vitriol a flame was produced. The Englishman improved on this by making his lucifer out of white phosphorus and sulphur, which lighted when he rubbed it on his pants. This was the good old eight-day match.

No matter how good a thing may be, there are always lots of people who want something different, even in religion. People wanted something that was quicker and less smelly, so the sulphur was left out and other things put in. Then the matchmakers objected to the use of white phosphorus because it gave them "phossy jaw" . So they left this out and put in a sulphide of phosphorus, This is the kind of match we use now.

Matches are usually soaked in paraffin to make them burn better, and in alum or phosphates to stop them from glowing after being blown out. All these things give us a pretty nice match that ought to suit nearly everyone, but since there is little else to object to we object to the price.

Parlor matches strike anywhere, like coal miners. Safety matches are different. They are grits and tories - cool enough when alone but get "het up" when brought together. The grits are on the match and consist of sulphide of antimony, powdered glass, glue and potassium chlorate which contains oxygen. The tories are on the match-box and consist of red phosphorus, which doesn't burn as easily as white phosphorus, together with other things. When brought together with a little pressure the heat developed sets the match off.

Some people don't need matches, because they can just rub their feet on the carpet and light the gas with the sparks from their fingers.

WEATHER EXPERT PREDICTS LEAN AND HUNGRY FUTURE

"The question of food will be the dominant one to be met by the ingenuity of man in future ages," J. B. Kincer of the U. S. Weather Bureau predicted in an address before the A merican Meteorological Society. Warning his co-workers that A merica is the world's last food frontier and pointing out the dependence of food upon favorable climate, he discouraged beliefs that the geographic distribution of rainfall can be changed through the influence of cultivation or otherwise than by nature's own slow processes.

Mr. Kincer said in part:

"Man must sustain himself from a very small portion of the earth' s surface. Three-fouths of it is water and of the remaining land a very large percentage is unsuited for profitable agriculture. In the western half of the United States, southern Russia, western China, and over vast areas within the tropics, limitations to intensive production are imposed by scanty moisture, while in the northern portions of the Northern Hemisphere, and in the higher elevations of middle latitudes, the limiting factors are low temperatures and the short growing season. More than one-half of the land area of the globe receives less than 20 inches of precipitation annually, and only about one-fouth receives those amounts which are best suited for agricultural purposes, namely, between 20 and 50 inches. Of this fourth, moreover, large areas are unsuited for cultivation, because of roughness, such as mountain sections, or because of low temperatures in more northern localities and high elevations, which leaves a very small percentage available for food production.

" Outside the temperate and tropical zones, the temperature conditions are generally unfavorable for plant growth, and of the 52,000,000 square miles of land within these zones, only about 20 per cent is potentially arable, a little more than half of which is, at the present time, cultivated or used for pasture. The world's food supply from cultivated crops is now produced on approximately 7 per cent of the land.

"In recent centuries, the population of the world has increased rapidly. The question of sustenance for the multiplied millions has been taken care of by migrations to less densely populated countries, principally the Americas, and by importation from foreign lands of plenty. By this process the unoccupied arable land of the world has been gradually occupied until today very little remains in regions with healthful climates. North America now leads the world in production of many food crops, yet but yesterday, as world history goes, it supplied food for only a handful of the Red Men of the forest. Today the United States, with only about 5 per cent of the world's population, produces about one-seventh of its cattle, one-fifth of its wheat, one-fouth of its oats, one-third of its hogs, and three-fouths of its corn.

"It is true that our production, by the utilization of all available resources, such as irrigation in the West, and intensive culture in the East, comparable to that practiced in the older and more densely populated countries, could be greatly increased. It has been estimated that we could feed between three and four hundred millions of people, but with the millions knocking at our door for admission, and our own natural increase in population , it is easy to vision the time, especially if we have unrestricted immigration, when this country itself would have to look elsewhere for food. The Americas are the world's last food frontier. When they shall have reached their maximum produc-

tion, if populations continue to increase as in the recent past, a serious situation will be presented."

SEES FARMS TURNED INTO GOLF COURSES

Farmers may lose their jobs altogether and the countryside be transformed into one vast golf course, if the prophecies made by Dr. J. H. Mathews before the meeting of the A merican Chemical Society come true. He predicted that some substance more efficient than the green coloring matter of vegetation in causing water and carbonic acid gas to combine will be invented in the laboratory.

In some way about which little is known, except that light is needed, this substance, chlorophyll, contained in the leaves of every growing plant, causes the union of water and carbonic acid gas, both of them always present in the atmosphere at the surface of the earth. Substances known as carbo-hydrates result, and these are the raw material of all food, except fish. Man either eats them himself or the animals that do.

But chlorohpyll is not especially good at the job, said Dr. Mathews.

"It is Nature's way, but frequently Nature does things exceedingly badly, and it is easy to conceive that a substance better able to do what chlorophyll does may be invented. It will then be possible to make carbohydrates directly in the laboratory, and so much more efficiently than they are made today that much of the land now needed for farms may be used as golf courses."

Rooms may soon be lighted by " cold light" from radiating paints, Dr. Mathews told the chemists, characterizing present methods of illumination as lamentably inefficient.

"A lighting system that delivers as light only three per cent of the energy utilized, can hardly be called efficient, "he said. "The trouble is that we have been depending for light upon heat radiations. What we need is a system based upon radiations from chemical reactions that will be 100 per cent. efficient. We need further study of the phenomena of phosphorescence."

Finally, Dr. Mathews said one of the greatest of problems was the utilization of the radiant energy of the sun, which as it falls upon the earth is ample for the needs of all its inhabitants if it could be put to use.

"There," said he, "is a source of energy that is entirely free, and which I don't think even Congress could find a way to tax it."

POWERFUL NEW ANTISEPTIC INVENTED BY CHEMIST

The invention and successful use of a new antiseptic substance, believed by the inventor to be eleven times as efficient as bichloride of mercury has been described to the American Chemical Society by the inventor, Prof. George W. Raiziss of the Graduate School of Medicine of the University of Pennsylvania. It is an organic substance, containing mercury. Its full name and pedigree is "4-nitro-3,5-bisacetoxymercuri-2cresol", which for practical purposes has been shortened to "metaphen" .

Dr. Raiziss reported that when diluted to one part in 20 million it prevented the growth of bacteria, and seemed to be eleven times as effective as bichloride of mercury. It has, he says, very little poisonous action when injected into the muscles, and is tolerated by rabbits when administered by the mouth in considerable doses. It seems, the discoverer claims, to have no bad effect on the kidneys such as other mercury preparations have, and it has been used with success in surgery and in infections of the eye, ear, nose, and throat.

A somewhat similar preparation of mercury, known as mercurochrome, has been used during the past year for intravenous injection in desperate cases of septicemia, or general blood infection, and has effected astonishing recoveries.

ATOMS WITHSTAND TERRIFIC ELECTRONIC BOMBARDMENT

Although an atom has been likened to a solar system, there is the difference that if some great star came shooting into the solar system it would never be the same again while an atom can be bombarded with electrons and shortly recover its previous state, Sir Ernest Rutherford, president of the British Association for the Advancement of Science, declares in a statement prepared for the Engineering Foundation.

Explaining the electrical structure of matter, Prof. Rutherford, says:

" All men deal with matter in the gross and our bodies are of it constructed. Mysteries of matter, therefore, have a fascination for thoughtful laymen, as well as scientists and technologists. The atom has long been familiar as the ultimate unit of matter.

" While the vaguest ideas were held as to the possible structure of atoms, there was a general belief among the more philosophically minded that the atoms could not be regarded as simple unconnected units. For the clarifying of these somewhat vague ideas, the proof in 1897 of the independent existence of the electron as a mobile electrified unit, of mass minute compared with that of the lightest atom, was of extraordinary importance.

" Our whole conception of the atom was revolutionized by the study of radioactivity. The discovery of radium provided the experimenter with powerful sources of radiation specially suitable for examining the nature of the characteristic radiations emitted by the radioactive bodies in general. The wonderful succession of changes that occur in uranium, more than thirty in number, was soon disclosed.

"It was early surmised that electricity was atomic in nature. This view was confirmed and extended by a study of the charges of electricity carried by electrons. Skillful experiments by physicists added to the knowledge of the subject. One of the main difficulties has been the uncertainty as to the relative part played by positive and negative electricity in the structure of the atom. The electron has a negative charge of one fundamental unit, while the charged hydrogen atom has a charge of one positive unit. There is the strongest evidence that the atoms of matter are built upof these two electrical units.

"It may be of interest to try to visualize the conception of the atom we have so far reached by taking for illustration the heaviest atom, uranium. At the center of the atom is a minute nucleus surrounded by a swirling group of 92 electrons, all in motion in definite orbits, and occupying but by no means filling

a volume very large compared with that of the nucleus. Some of the electrons describe nearly circular orbits round the nucleus; others, orbits of a more elliptical shape whose axes rotate rapidly round the nucleus. The motion of the electrons in the different groups is not necessarily confined to a definite region of the atom, but the electrons of one group may penetrate deeply into the region mainly occupied by another group, thus giving a type of inter-connection or coupling between the various groups. The maximum speed of any electron depends on the closeness of the approach to the nucleus, but the outermost electron will have a minimum speed of more than 600 miles per second, while the innermost K electrons have an average speed of more than 90,000 miles per second, or half the speed of light.

"The nucleus atom has often been likened to a solar system where the sun corresponds to the nucleus and the planets to the electrons. The analogy, however, must not be pressed too far. Suppose, for example, we imagined that some large and swift celestial visitor traverses and escapes from our solar system without any catastrophe to itself or the planets. There will inevitably result permanent changes in the lengths of the month and year, and our system will never return to its original state. Contrast this with the effect of shooting an electron through the electronic structure of the atom. The motion of many of the electrons will be disturbed by its passage, and in special cases an electron may be removed from its orbit and hurled out of its atomic system. In a short time another electron will fall into the vacant place from one of the outer groups, and this vacant place in turn will be filled up, and so on until the atom is again reorganized. In all cases the final state of the electronic system is the same as in the beginning."

DEVISE WAY TO PICK SINGERS WITHOUT KNOWLEDGE OF MUSIC

How singers who will satisfy masters of music can be selected by music-deaf scientists without either seeing or hearing them sing, was explained to the American Physical Society meeting here by Douglas Stanley, teacher of voice and Prof. H. Horton Sheldon of the Department of Physics of New York University.

They described the method by which they claim to have definitely established a relationship between the vocal technic of the singer and certain curves made by a mechanical-electrical apparatus actuated by the singer's voice. By reading these curves, it is possible to tell whether or not the voice was being used under proper physiological conditions and whether or not it might be considered satisfactory by a musician.

The curves show breath output plotted against intensity with pitch and vowel constant, and breath output plotted against pitch with intensity and vowel constant These curves are compared with ideal curves.

Use of this method has demonstrated that the old idea of " breath control" is fallacious and that the expulsion of breath should be by the muscles of the larynx and not by those of the respiratory system, the physicists were told.

Bacteria are the world's best manufacturers of fertilizers.

CHEMISTS FIND CHEESE RESISTS GAS ATTACK

American swiss cheese has been attacked with a most deadly war gas and then fed to cheese makers and mice. Both mice and men are still alive and ready for more. These facts were brought out at a meeting of the American Chemical Society at which E. L. Griffin of the U. S. Bureau of Chemistry and E. A. Back of the U.S. Bureau of Entomology presented the results of experiments in fumigating food products with hydrocyanic acid gas, to prevent insect damage.

The hard rind of the A merican swiss cheese kept it from absorbing the gas, The packing of dried fruits and other food products was also found to be important in preventing the gas from getting in. The tightly packed fruit let in less of the gas.

Chocolate-coated nuts were also found to absorb more gas than the chocolate creams. The coated nuts were rougher and had more surface exposed. Chocolate absorbed much less than cocoa for a similar reason. The cocoa being finely powdered had a large surface for each unit of weight.

Hydrocyanic acid is used as a fumigant for the holds of ships to kill the insects which are the greatest menace to the keeping qualities of dried fruits, and other food products. It is commonly mixed with a tear gas, so that persons who may accidently be in the neighborhood may be warned by their tears and escape the deadlier gas.

FILMS FASTEST IN ARID AIR

Photographic plates and films are fastest when the relative humidity of the air is about 20 per cent., according to Dr. P. V. Wells of the E. I. DuPont de Nemours Powder Co. Twenty per cent. relative humidity is about that of deserts and arid climates, or of more humid regions such as the Atlantic coast states on a particularly clear, warm, spring day.

It has long been known that films were faster in dry weather than in humid, but that the speed falls off when the humidity gets below 20 per cent., is a new discovery, the reason for which is not known. Taking the average speed of a cine-positive film as 100 at a humidity of 40 per cent. then the speed of a cine-positive film at 80 per cent. humidity is 92 and at zero humidity 102. These values compare with a maximum value of 107 at 20 per cent. humidity . The figures for cine-negative films were similar.

The reasons for this eccentric behavior on the part of the films, are, Dr. Wells said, not known, but probable explanations point toward some action of the moisture in the air on the grains of silver bromide in the film. This in turn gives a clue toward the structure of these crystals and to the real mechanism of Photography, problems yet to be solved.

CHEMIST TELLS OF DANGER FROM AUTOMOBILE EXHAUST

Automobilists can not be too careful about always opening the doors or windows of garages before starting the engine, says Dr. W.P. Yant of the U.S. Bureau of Mines. Dr. Yant has conducted experiments on the amount of deadly carbon monoxide

gas liberated by automobile engines when idling in garages.

He reported that in a closed garage of 1500 cubic feet capacity, or 10 by 10 by 15 feet, the average motor engine would produce enough carbon monoxide in eight to ten minutes to cause death to any person in the garage. Considering the variability of engine performance and of personal susceptibility to the gas, Dr. Yant said:

"There seems to be no limit of time during which the engine may be run in a closed private garage with safety. The doors should be opened even if the engine is to be run only long enough to take the car out, for a few unheeded minutes spent in examining the gasoline tank may be disastrous. Even allowing for ventilation at the rate of one change of air in the garage in an hour, an idling engine can produce a fatal concentration of carbon monoxide in seven minutes. All lengthy test should be made in the open air."

EXPERTS FIND FAULT WITH HOME-MADE APPLE SAUCE

Mother killed a valuable vitamin when she made apple sauce by the old recipe, Edward F. Kohman, Walter H. Eddy and Victoria Carlsson charge. Vitamin C, the vitamin which prevents scurvy, was the one destroyed. The experts told how the fruit should be prepared to preserve this vital food factor and also prevent corrosion of cans after canning. All fruits use oxygen in a breathing process not unlike the breathing of animals. It is this oxygen in the fruit which destroys the vitamin, and the way to prevent the destruction is to get the oxygen out of the apples before the cooking starts.

This can be done by peeling and quartering the apples and keeping them overnight under water containing about one per cent, of salt. Deprived of oxygen supply from the air in this way, the apples use up the oxygen in their tissues. This drowning of the apples saves Vitamin C.

FIDO'S ANTISEPTIC LICK

Everybody has noticed how when faithful Fido returns home late, more or less damaged by chance encounters with "lowlife" curs up the alley, he puts in a good hour or so licking his wounds. Science Has shown this to be an application of some of the most modern methods of antisepsis. An examination of the saliva of human beings or animals shows the presence of materials known as oxisases or peroxidases. These promote oxidation or slow burning of the tissues or other substances, including evil germs. When Fido licks his wounds he is merely applying the same medical technic that his master does when using the medicine cabinet. Not being ablt to get his antiseptics out of bottles, he merely used what Nature has provided for him.

Paper, old clothes, sacking, and other inflammable materials are made into felt and combined with asphalt and minerals in such a way as to produce fireproof sheeting and shingles.

A SELF-LINING FURNACE

Furnaces for making alundum, an artificial abrasive invented about twenty years ago, used to be lined with expensive carbon blocks because no other lining was known which could stand the high temperatures needed in the process. When the carbon blocks became worn, the molten alundum sometimes flowed against the steel shell of the furnace, and it was the custom of the furnace man to turn a hose on the red-hot spot before it melted through. One man noticed that whenever the water cure had been applied the spot never got hot again during the run. He designed a furnace the whole outside of which would get such a " water cure" . Some technologists condemned the new furnace as inefficient, but it worked and reduced the cost just the same.

TABLOID BOOK REVIEW

BUILDING FOR PEACE. By Professor A. A. Noyes of the University of Illinois. I and II. New York: Chemical Catalog Co. 25 cents each.

After officials, politicians and journalists have tried their hands at rectifying the European muddle a chemist undertakes to find out where the fault lies and what can be done about it.

Professor Noyes gives in these pamphlets his personal observations and letters exchanged with French and German scientists.

SCIENTIFIC POETRY

Dante wrote parts of the " Divine Comedy" with a map spread out before him. So think scholars who have found brief descriptions of regions in that great poem extremely incisive and accurate. Certain passages in the " De vulgari Eloquentia", a work in which the great poet lays down the rules of poetic composition, could hardly have been written without reference to a map. Though Dante wrote no treatise devoted specifically to geography, he had a clear understanding of the relative positions of places in Italy and its neighboring lands and his greatest poem is based on the orthodox geographical theories of his time.

Coats of rats become darker when the rats are fed a large amount of protein.

Hume reservoir, along the Murray river in Australia, will, when fully developed for irrigation and power purposes, be the fourth largest storage basin in the world.

Eskimos frequently build underground houses of stone and use the jawbones of whales for roofing material.
