

CHEMISTRY

Mystery Fuel Tank Explosions Blamed on Bacterial Action

Chemists Hear Informally of Discovery of New Species Which Can Live on Kerosene and Ferment It Into Ethane

OUT of England's mystery of exploding gasoline storage tanks, which Scotland Yard first thought was the work of recent Irish terrorists, has come the amazing discovery of a species of bacteria which can live on kerosene and ferment it into ethane and methane fuel gases, just as ordinary bacteria can ferment sugar into alcohol.

At the meeting of the American Chemical Society in Boston, the new discovery has chemists shaking their heads and speculating on this new-found way to let nature create for them these hydrocarbon gases which can be the starting point of a host of synthetic chemical compounds.

The new kerosene-fermenting organisms were first described informally, and totally unreported, at the meeting of the International Congress for Microbiology in New York. The eminent British bacteriologist, Dr. A. C. Thaysen of Great Britain's National Scientific Laboratory at Teddington, who is now on the high seas hurrying back for military service, described the new discovery.

His story, as related by chemists who talked with him in New York, runs like this:

Scotland Yard for months has been puzzled by mysterious explosions in gasoline storage tanks holding their war-time precious fuel. Sabotage was suspected but unproved, for the terrific explosions brought complete catastrophe. Dr. Thaysen, as the government's expert on the generation of gases by bacteria, was also called in but could find no answer.

Finally, and fortunately, a kerosene tank blew up. A quick examination after the explosion showed bubbles of gas rising from the layer of water at the tank's bottom on which the kerosene had been floating.

Taking some of the water and sediment to his laboratory, Dr. Thaysen discovered his new kind of bacteria which can live in kerosene and ferment it into 10% ethane and 90% methane. He cultured this organism and then sub-cultured it and obtained a pure strain of

bacteria that would grow and propagate. It was the explosive methane and ethane gas generated by these bacteria which caused the explosions. While he has not yet solved the gasoline explosions he is virtually certain that a similar action occurs there too.

Chemists here who understand bacterial fermentation see no reason why the discovery is not true, for they know of organisms which will live in strange places and which can ferment phenols like carbolic acid, and also benzoic acid.

Dr. Thaysen is well known in his field as a careful investigator. While the new discovery must, of course, be substantiated by other workers, the chemists are giving credence to Dr. Thaysen's amazing report.

Science News Letter, September 23, 1939

New Chemical Compounds

BY studying a way to produce artificially the red coloring matter of the blood, hemin, chemists have discovered a wholly new class of chemical compounds of surprisingly simple construction, having only 12 atoms to its essential nucleus.

Prof. Alsoph H. Corwin and Rudolph C. Ellingson of the Johns Hopkins University told the meeting that they had found the new class of chemicals in their synthetic hemin production because they noticed, on occasions, that they obtained yellow colors instead of the red ones.

Solutions containing these yellow colors had the characteristic of showing greenish-blue fluorescent hues that made them look like lubricating oils.

In the chemical detective work of learning the structure of this new kind of chemical molecule, Prof. Corwin and Mr. Ellingson found that a molecule of ethyl, or grain, alcohol had disappeared in the chemical reactions leading to its formation. Thus they set about systematically inserting, at known spots in the molecule, a piece of methyl alcohol. This served as a "tag" to mark the key points of the new molecular structure that formed the new yellow compound.

A molecule of only twelve atoms is relatively simple in organic chemistry where the number of artificial chemical compounds now approaches nearly a million, Prof. Corwin said. But a search of chemical literature failed to show a previous discovery of the new kind of yellow molecule.

"Very little is known about the properties of the new compounds as yet," Prof. Corwin said. "They may be poisonous or not, helpful or harmful. The only thing known with certainty is that various members of this group are capable of making practically any liquid look as if it were lubricating oil because of the greenish-blue hue they give off as fluorescence."

Science News Letter, September 23, 1939

Research Can Prevent War

SCIENTIFIC research can eliminate the economic causes of war, Dr. Karl T. Compton, president of Massachusetts Institute of Technology, noted scientist and a member of the newly-created National War Resources Board, told the dinner meeting of the American Chemical Society.

"Science can never overcome the desire which some men have for domination," President Compton declared. "It cannot remove ambition and envy from the human breast. But insofar as wars may be induced by economic considerations, science may do much to remove the causes."

Outside of sheer domination wars come because one nation wants the economic resources held by another. Great Britain wants oil and food which the British Isles cannot produce. Germany and Japan want rubber, foodstuffs and mineral resources. It is from these and similar wants that modern wars spring, Dr. Compton said.

The necessities for these economic needs of nations can be taken care of by scientific research, Dr. Compton continued. Synthetic substitutes can be created at a cost far less than a major war and within a time far less than that in which the effects of a major war can be recovered from, he said. "At the same time this could be done not only without hurting anyone but with great indirect benefit to all concerned."

As examples of substitutes already known, Dr. Compton gave:

1. Synthetic gasoline from coal. Coal sources are much more abundantly distributed throughout the earth than are petroleum fields. (Turn to page 205)

PUBLIC HEALTH

Pneumonia Death Rate Cut By Use of Sulfapyridine

Report From Norway Shows Reduction of Fatalities Of Three Fourths or More; "Nonallergic" Label Banned

THE PNEUMONIA death rate in Norway has been cut three-fourths or more by the use of the new chemical remedy sulfapyridine, the Oslo correspondent of the American Medical Association reports. (*A.M.A. Journal*, Sept. 2). Serum treatment of pneumonia was never very popular in Norway, chiefly because of the frequently great distances between the patient and a laboratory where typing of the pneumonia germs could be done. This disadvantage does not hold for sulfapyridine, which is apparently being widely used. Records from various hospitals show that among 342 uncomplicated cases treated with this new drug, there were only 20 deaths, giving a death rate of 5.8 per cent contrasted with a rate of from 20.5 to 35.2 per cent in the pre-sulfapyridine period of 1928-1938.

Science News Letter, September 23, 1939

Combat Tropical Diseases

SULFAPYRIDINE, sulfanilamide and other members of this powerful disease-fighting family of chemicals are winning fresh triumphs against diseases that threaten life and health in the tropics, according to reports of discussions at the Royal Society of Tropical Medicine and Hygiene in London. Most impressive, perhaps, are the experiments showing "remarkable results with sulfapyridine for plague, although little has been published about the drug's action on bubonic plague in man. Elephantoid fever and some strains of malaria may also be controlled by the chemical remedies.

Science News Letter, September 23, 1939

Whitens Negro Skin

LOSS of coloring matter from the skin of Negro and white workers in a leather manufacturing company was traced, by Drs. Edward A. Oliver, of Chicago, and Louis Schwartz and Leon H. Warren of the U. S. Public Health Service, to an ingredient in a certain brand of rubber gloves worn by the workers. The ingredient is an antioxi-

dant known by the trade name of Agerite Alba, the doctors reported to the A. M. A. Workers in other tanneries, plating works, electrical apparatus manufacturing and all other places where that particular brand of rubber gloves was worn were found to be having the same skin trouble. The rubber company has withdrawn the antioxidant from the rubber glove formula and the workers are all gradually getting the color back in their skin since they have stopped wearing gloves containing this ingredient.

Science News Letter, September 23, 1939

"Nonallergic" Label Banned

MUSCLE oil, contour cream, skin food, rejuvenating cream, hair color restorer and hair grower are among the terms formerly seen on labels of cosmetics which are now banned by the new laws governing foods, drugs and cosmetics. Commenting on the list of banned terms recently issued to manufacturers by the federal authorities, the editor of the American Medical Association calls special attention to the term "nonallergic" now also banned by federal law. The term is considered misleading because while cosmetic products may be and are made without such ingredients as orris, to which many persons are allergic, even the simplest preparation may be allergenic to susceptible persons. The problem of allergy was one of the first attacked by an A. M. A. committee appointed, before the new federal laws were passed, to advise the Journal of the A. M. A. concerning cosmetic products advertised in its pages.

Science News Letter, September 23, 1939

President James Madison over 100 years ago predicted that by 1930 the United States would probably have 192,000,000 people.

An apparatus for de-insectizing airplanes has been devised by a South African health official, who sees grave danger of airplanes spreading yellow fever throughout Africa.

● RADIO

O. C. Durham, chief botanist at the Abbott Laboratories, will be the guest scientist on "Adventures in Science" with Watson Davis, director of Science Service, over the coast to coast network of the Columbia Broadcasting System, Monday, October 2, 4:30 p.m., EST, 3:30 CST, 2:30 MST, 1:30 PST. Listen in on your local station. Listen in each Monday.

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2. Synthetic rubber can be made for automobile tires and the countless other uses of rubber out of raw materials such as air, coal, limestone and water that are widely distributed.

3. "Chemical agriculture" growing an abundance of food in tanks and other compact places can overcome the fear of nations about their food supplies.

4. The development of lacquers for the interior linings of food containers has overcome the fears of the U. S. about a stoppage of Bolivian tin supplies.

"A good deal has been said about the ways in which science has been applied to make warfare more destructive, just as science has also been applied to bring about a certain compensating degree of protection against new weapons. . . . Far more significant than these is the use of science to remove some of the major causes of war," Dr. Compton declared.

Science News Letter, September 23, 1939

"Chemical Dice Game"

A "GAMBLING" type of chemical reaction, new to science, promising important developments in America's \$200,000,000 organic chemical industry, was announced at the meeting. It may explain even the aging of wines and liquors.

The new reaction, revolutionary in its fundamental concepts, obeys the laws of

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chance by which mathematicians can determine the odds in games like dice, poker and bridge.

One might call the new reaction a "chemical dice game," said Dr. George Calingaert, director of chemical research of the Ethyl Gasoline Corporation, who described the new discovery. It takes place between chemicals ordinarily considered inert to one another and without chemical affinity which is usually thought to produce chemical activity.

So new is the discovery that its potentialities are as yet unrealized, but they are believed to be very important.

By what is called the "redistribution reaction," chemical compounds are found to redistribute themselves into a number of compounds in the presence of a proper catalyst. It is possible to predict by the mathematical laws of chance, or probability, just what the end distribution of these new compounds will be.

The new reaction may help to explain the reactions which occur during the aging of wine or liquors. These subtle changes do occur, for man's taste is able to detect the differences. But chemical tests are worthless to measure the changes. Why they occur is still more of a puzzle.

"It may well be that this aging is in fact a 'natural redistribution' among the esters which are known to constitute the flavoring portions of these liquids," Dr. Calingaert said. "If such should prove to be the case, it seems likely that a better understanding of the nature of the aging process will soon lead to improvement in the technique of accomplishing this all important result.

"Simple catalysts were used throughout the experiments. These catalysts weaken intramolecular attractive forces commonly considered to be quite firm. The groups of atoms, which break loose from the molecules, interchange purely at random with other similar groups. After these random interchanges have taken place long enough, a state of 'mathematical equilibrium' is reached in which

the composition of the reacting mixture exactly equals that which can be predicted by the laws of chance."

Dr. Calingaert's initial experiments were carried out in research on the nature of tetraethyl lead and related "anti-knock" compounds for gasolines.

It is already known, however, that the new type of chemical reaction takes place between compounds which chemists say are inert to one another, such as gasoline and kerosene, or milk and cream. All customary signs of chemical reaction are absent. There is no formation of a solid precipitate, or a gas, or even the heat so common to many chemical reactions.

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Coldest Refrigerator

THE world's coldest refrigerator, operating at 450 degrees below zero Fahrenheit, is in prospect as the result of discoveries reported by Prof. S. C. Collins of Massachusetts Institute of Technology.

The new type refrigerator would operate on compressed helium, the light inert gas used to inflate airships. When liquefied, helium produces the coldest cold known to man, only a few degrees above absolute zero.

"One does not ordinarily think of a steam or a compressed-air engine as being a refrigerating machine," Prof. Collins reported.

"Yet the well known principle on which they operate consists of the withdrawal of heat from the working gas and its conversion into work. Any gas expanding against a working piston is cooled by expansion. For instance, the temperature of a sample of air originally at 70 degrees Fahrenheit will fall more than 100 degrees if allowed to double its volume in an engine cylinder."

Major trouble to be overcome in a compressed helium engine, Prof. Collins indicated, is the matter of lubrication, for at 450 degrees below zero Fahrenheit all

lubricants now known are frozen solid.

Prof. Collins solved this difficulty by doing away with lubricants and replacing the conventional piston of an engine with a flexible diaphragm of stainless steel. This diaphragm is sealed at its edges by a copper gasket between two steel plates. The expansion of the helium occurs between the diaphragm and one of the plates.

Two or even three such engines will be used in consecutive stages in refrigeration, for it is not practical to try to reach the extreme low temperatures in one single jump down the temperature scale.

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Sell Heavy Carbon Atoms

MASS production of heavy carbon, the isotope of the ordinary kind of carbon that is a basis of all living matter, was announced at the meeting by the Nobel Prize chemist of Columbia University, Prof. Harold C. Urey, who won the world's outstanding scientific award for his discovery of heavy water.

By the chemical method of separating the heavy kind of carbon of mass 13, from ordinary carbon of mass 12, Prof. Urey is now able to supply the needs of scientific workers all over the world with this valuable stable kind of carbon whose atoms can be used as tags to aid chemists in labelling parts of their atoms.

By adding atomic tags at the proper places scientists can carry out intricate reactions and then detect, in their results, the movement, within the molecule, of the atomic tags.

With the successful production of quantities of carbon of mass 13 (which, incidentally, you can buy at \$400 an ounce) the elements hydrogen, carbon, oxygen and nitrogen are now available in their stable isotopic form for use as tags in research. These four elements are found in over 90% of all chemical compounds known, and are especially important in all biological problems.

The other way to produce tags on atoms to trace out chemical behavior is to bombard them in atom smashing machines and render them radioactive. This radioactivity, or spontaneous disintegration, can then be detected with the proper instruments.

To a member of the Science Service staff, Prof. Urey explained: "Much interest has been exhibited in recent years in artificially radioactive substances in solving important biological problems. But it really seems to me, at the present time, that most of these problems can be

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solved best by the use of the stable isotopes of the overwhelmingly important elements, hydrogen, carbon, oxygen and nitrogen which can only be supplied in quantity by the chemical method of the separation of isotopes.

"Fortunately it appears that the stable and radioactive isotopes complement each other in scientific investigation. The chemical method of separation of isotopes works best with the all-important elements, hydrogen, carbon, nitrogen and oxygen. The method of thermal diffusion and the artificially radioactive method of tagging elements works very well for the remainder of the elements in the periodic table."

While atom smashing and the production of radioactive elements for biological and chemical experiments is the current trend in physical science there are a whole host of experiments which are lengthy ones, involving the feeding of experimental animals with isotopic materials. For all such experiments, many of them the most important in the realm of biology and physiology, it is essential to have stable isotopes and not radioactive ones which disintegrate quickly. The half life of radioactive carbon, the element found in all living matter, is only about 20 seconds. Experiments performed with radioactive carbon must be done quickly. Such haste, potentially, may lead to errors.

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AGRICULTURE

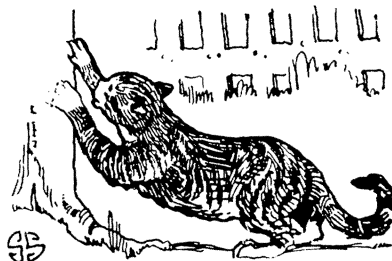
Europe's Good Crops Promise To Prolong War

EUROPE has good crops this year, a U. S. Department of Agriculture survey shows. The war will therefore go on that much longer before old General Starvation begins his inevitable campaign. Herr Hitler waited until the reapers had gathered in the grain before sending them out to be scythed down themselves.

Potatoes and sugar beets, top crops in both Poland and the Reich, have yet to be dug: their harvest season is September and October. After that the diggers can go to work digging for themselves—trenches, and graves.

Europe's corn crop, like America's, is of bumper proportions this year. There is at least a fair chance that it may be harvested and not tramped down by hobnailed boots—the Iowa of Europe lies in countries that are still neutral: Rumania, Yugoslavia and Hungary.

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Tame or Domesticated?

WIDESPREAD custom regards "domesticated" and "tame" as synonyms. Yet even a moment's reflection will show how far from fact that is.

A domesticated animal is one that has been brought into common use by man, for food, clothing, work or other human purposes. It may still be able to get along all right in the wild if it escapes or is lost, like the turkey or the goat, or it may have been so changed by breeding that it would perish if restored to natural conditions, like modern high-bred hogs or sheep.

A tame animal, on the other hand, is one that is on friendly terms with man, whether it is useful to him or not. It may be intimately domesticated like the dog, or loosely domesticated like the cat, or not domesticated at all. We all know of tamed wild animals of the widest variety, from squirrels, chickadees and turtles to toads, crows and even skunks.

Some of the most traditionally domesticated animals are not tame at all. Silkworms, for example, are known only in domestication, yet no one ever thinks of them as tame animals. Bees also are domesticated insects (though carelessness may permit a swarm to escape to the wild), but they certainly are not tame. Sight of a bee-keeper, with his veil, gloves and smoker, is testimony enough on that point!

Larger domestic animals are often just about as unruly and hard to handle as bees. Travelers tell of the struggle that ensues whenever a Lapp woman wants to milk a female reindeer, or when her husband tries to harness up his sledge. The intractability of camels, and of their South American cousins, the llamas, is proverbial. Closer home we have the more familiar examples of the donkey and of his illegitimate child, the mule.

Sometimes the absence of tameness in

a domestic animal seems to be the result of differences in physiology, particularly sex. Most cows, ewes and she-goats are tractable and tame enough, but who would ever be foolish enough to turn his back to a bull, ram, or billy-goat?

At certain times, however, even the tamest of female animals will turn savage, especially when they have a brood of young. Tabby, who obligingly runs up a tree for the amusement of any wandering dog, will be turned by a litter of kittens into a prowling, demon-eyed murderess, just daring any canine to venture within a city block of her lair.

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ARCHAEOLOGY

Egyptian Paintings Found In South African Cave

CAVE paintings that seem to be the work of ancient Egyptians, not primitive Bushmen, are the reported discovery of a northern Transvaal farmer, G. Gadda.

Recognizing possible importance of the paintings, which if actually Egyptian would revise ideas of South Africa's history, Mr. Gadda has arranged for Dr. Robert Broom of the Transvaal Museum to inspect the cave.

Whether or not Egyptians explored or colonized in South Africa has been frequently argued, and the finding of Egyptian art so far inland would be a valuable clue. Twelve years ago, paintings found on rocks in southern Rhodesia, not far north of the present find, were considered by some observers to be significantly like Egyptian art, but more evidence has been awaited.

According to the Greek historian Herodotus, fifth century B.C., Pharaoh Necho sent a fleet manned by Phoenicians from Egypt to sail around Africa, about 600 B.C. Until recent years, this was regarded as an unlikely story.

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PHYSICS

Old Phenomenon Used In Modern "Black-Outs"

LIGHT STUFF. Street signs and direction markers that glow under invisible light in black-out Europe use an old phenomenon. Fluorescence under ultraviolet light is widely used in theatrical productions for changing costumes and scenery with the flick of a switch. In the new tubular lamps it is used to convert electricity into light more efficiently.

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