Chemistry of Fires, Drugs, Atoms, Sugars

Chemistry

What is talked about when chemists get together is told in these reports of the St. Louis meeting of the American Chemical Society, April 16 to 19, written by Dr. Edwin E. Slosson and Watson Davis.

A blazing fire of burning gasoline in the parlor of the St. Louis headquarters hotel of the American Chemical Society was put out with a dash of water. The firemen were a couple of young chemists from Dayton, Ohio, Charles Allen Thomas and Carroll H. Hochwalt, the extinguisher was a new chemical mixture of their discovery, and the fire was a demonstration.

As every automobilist knows, or ought to know, water will not extinguish a gasoline flame but the secret of success in this spectacular demonstration was that a common salt of potassium was dissolved in the water. This new method of extinguishing oil fires is called a "catalytic effect" by the discoverers. Hitherto fire extinguishers have been based upon two well known principles, either smothering the fire by shutting out the oxygen of the air as by the use of carbon tetrachloride or cooling the combustible below the kindling temperature as by water. But the effect of this new form of fire extinguisher appears to depend upon the chemical composition of the salt dissolved in the water. The most efficient substances were found to be salts of the alkali metals, not merely potassium but still more the rare elements, rubidium and caesium. Salts containing an abundance of oxygen proved most effective. It is surprising to find chief among these chemical fire extinguishers potassium nitrate, which is an ingredient of gunpowder, and potassium chlorate which is employed in explosives. Among the useful substances in this scheme for fighting the flames were salts of acetic, the vinegar acid, butyric, the rancid butter acid, tartaric, the grape acid, and lactic, the sour milk acid. It is expected that aqueous solutions of some of these will be found useful in hand extinguishers for automobiles and garages and for automatic sprinklers for buildings where gasoline and oils are stored. The Underwriters Laboratory of Chicago report that the one and three-quarter gallon extinguisher is very effective on both oil and wood fires.

Boosting Drugs

A new method of rendering drugs more potent against disease and at the same time less harmful to the patient was demonstrated by Dr. M. L. Crossley, chemist of Bound Brook, N. J. Some magnesium salt is administered with the medicine. This seems somehow to energize the drug, perhaps by opening the doors of the system so as to let it enter and spread more freely through the body. At any rate it serves to reduce the dose and quicken the action in many cases. In reducing temperatures of fevers, in deadening pain or producing insensibility the effect of many medicines was doubled by employing magnesium as a booster. Aspirin for instance was twice as effective in combination with magnesium. A man racked with arthritis was relieved of pain within twenty-four hours. When morphin is used after an operation to prevent suffering the injection generally has to be repeated in about four hours but when magnesium was added the analgesic influence lasted for fifteen hours. Codein by itself has no antipyretic action but with magnesium is very effective in reducing the fever. Any compound of magnesium may be used.

Pure Air

A call for a crusade for pure air following the fight for pure food and the fight for pure water was the main message of the presidential address of Prof. Samuel W. Parr. Over eighty per cent. of the fuels now in use are smoke producing. This is not merely a waste of combustible material but increases laundry bills, injures merchandise and impairs health by filtering out the ultraviolet rays of the sunshine with a smoke screen and by corroding the lungs with sulphur fumes. The domestic chimney is a worse offender than the factory. The supply of anthracite is inadequate but smoke can be equally well eliminated by converting bituminous coal to gas and coke or to some semi-coke combustible, a field in which Prof. Parr has conducted research at the University of Illinois for a quarter of a century.

The expansion and increase of efficiency in the use of power, said Prof. Parr, "is to be credited to the engineer whose strides can be readily noted in more scientific boiler settings, improved stokers, turbine engines, pulverized coal, superheaters, economizers and high boiler pressures. One might think that the engineer had about reached his limit, but more likely he has just made a good beginning providing he calls in the chemist for cooperation in the next chapter."

Pure Water

Pure water was credited with the reduction in the use of alcoholic liquors and the bringing about of prohibition in an address by Dr. William J. Mayo, the Rochester, Minn., surgeon, who spoke at the same session with Dr. Parr.

Explaining that European peoples had taken to wine and beer not for love of alcohol but because of lack of safe water, Dr. Mayo declared:

"Simultaneously with Vienna's introduction of a pure water supply from the mountains, her per capita consumption of spiritous and fermented liquors was reduced spontaneously forty per cent. The introduction of a pure water supply in the various states in our country has been followed by a temperance movement, and finally by prohibition.

"The drink habit was one of the many forms of protection resorted to by nature to save man from filth diseases which cause death, or that which is worse than death, intellectual deterioration.

"Prohibition outlawry is largely from the alien who comes from countries where water could not be used for drinking purposes and also, of course, from the dregs and froth of our own citizens."

Lactic Acid History

How the course of American history was changed by a complex chemical reaction was explained by Dr. Mayo. The resistance of the South was strengthened and the Civil War prolonged two years by the skill of Stonewall Jackson in replacing lactic acid by glucose in the muscles of his ragged barefoot men when he marched his troops with unexpected rapidity in the region across the Potomac from Washington in defense of Richmond. Violent exertion produces an accumulation of lactic acid in the muscles and so causes fatigue but this was relieved by General Jackson who ordered his men after marching several hours to lie flat on the ground and relax for a few minutes. (*Turn to next page.*)

Chemistry of Fire, Drugs, Atoms—*Continued*

Then their strength was restored by sugar and other carbohydrates from the sutler's wagons. With the clinkers thus out and their furnaces stoked with fresh food at intervals the Confederate soldiers could make forty miles a day and still be fit for fighting. This was before the days of nutritional physiology which nowadays gives us the reason for such practices and enables us to employ these principles in health and disease.

Matter's Heart

The heart of matter, the muscles of the atom, is being attacked by chemists with projectiles traveling 10,000 to 12,000 miles a second in an attempt to discover its nature and provide new information and theory. Further industrial advances and a better understanding of the way in which the universe is put together are expected to result.

In making new drugs, dyes, and the multitude of other chemical compounds that have been so instrumental in revolutionizing the world we live in, chemists have been concerned with only the outside of the atom. There the electrons circle around the nucleus like planets around the sun. But the center or nucleus is also vitally important, Dr. S. C. Lind of the University of Minnesota declared. Although but one hundred thousandth of the whole diameter of the atom, the nucleus determines the identity of the chemical element. Change it and the element is transmuted. Smash it hard enough and there may be released enormous stores of energy that may blast the earth, some theories have contended.

So far only the lightest and simplest elements have been disintegrated by bombardment with the speedy alpha rays from spontaneously exploding radium. Through the use of millions of volts of electricity which it will soon be possible to produce, much more powerful and heavier particles will be thrown into atomic hearts with results that may startle the world.

Far beyond the reach of the microscope are atoms and electrons. Yet their flashing travels, wrecks and transmutations can be seen and put in the movies. Prof. William D. Harkins of the University of Chicago revealed that his experiments have recorded the tracks of a million atoms passing through a hundred thousand million atoms of air. With all this traffic collisions are relatively few since only thirty sharp conflicts were recorded on the 100,000 photographs. The path of the atoms is made visible to the eye and camera by allowing the shooting to take place in a wet atmosphere. Each atom leaves behind it a trail of water vapor distinctly visible.

New Liquid Fuels

The possibility of producing new liquid hydrocarbons by bombarding gases with radium rays and electricity was reported by Dr. Lind in another communication later in the meeting. By similar methods German chemists are reported to be attempting to produce lubricating oil, thus making that country independent of foreign petroleum.

Fighting Tuberculosis

Cooperation of the biologist and chemist in research upon the fundamental nature of tuberculosis was declared by Dr. William Charles White of the U. S. Public Health Service to offer hope for new progress in combatting this and allied diseases. Large batches of germs, some of them containing thirteen trillion tubercule bacilli, have been subjected to accurate chemical analysis. Ten substances, each with definite effects upon the animal body, have been isolated from these germs. More than twenty organizations and laboratories are cooperating in the research. One part of the germ, the phosphatide fraction, was found to make cells grow rapidly and wildly as if they were a cancer. Leprosy, whose causative germ can not be distinguished microscopically from that of tuberculosis, is also being studied.

Artichokes

A rival of the Irish potato, which will also compete in sugar production with the sugar beet and the sugar cane, was introduced to the chemists by Dr. Frederick Bates, sugar chemist of the U. S. Bureau of Standards, Washington. It is the Jerusalem artichoke long used in Europe for cattle feed, but in this country usually classed with the turnips in the minds of housewives. From these artichokes the manufacturer can obtain large quantities of an uncommon sugar, levulose, which is fifty per cent sweeter than cane or beet sugar. Since the artichokes can be grown with little hand labor and can be stored easily they promise to supplement or even replace beets as the raw material for sugar factories in the beet belts. Although experimental work has shown that high yields of levulose can be obtained from the artichoke, a continuous commercial process of sugar extraction has not yet been perfected. A factory plant on a small scale is now being installed at Washington to solve this problem.

This is the second new sugar industry that Dr. Bates has helped establish through fundamental research work. Six years ago he showed corn products manufacturers how to make dextrose, corn sugar or pure glucose from corn, and now 150,000 tons a year are produced.

While studying the artichoke as a sugar-producing tuber, it was discovered that artichoke flakes or chips, flour, paste and other products can be made to compete with similar foods from potato, wheat, etc. It is claimed that diabetics can eat levulose sugar and products with little harm to their condition, although the ordinary sugars and starches are dangerous.

Native Gums

New gums from native plants which may take the place of exotic products were reported by Prof. Ernest Anderson of the University of Arizona. The common mesquite bush of our southern deserts yields a mucilaginous material that is similar to gum arabic. The cholla tree cactus exudes from insect wounds in its skin drops of a substance resembling gum tragacanth.

Science News-Letter, April 28, 1928

The Dangerous Period

General Science

L. L. WHYTE, in *Archimedes* (Dutton):

The supremely difficult task of the next hundred years will be to keep the mind of the race healthy and stable through a period of critical sensitiveness. We are in a transition stage of violent instability, of intense cruelty coupled with compassion (America), of blended love of liberty and need of discipline, of emotional religions and of wars—but we must hope that it will lead to some mode of life with greater inherent stability.

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Automobile accidents in 1920-1926 increased 64 per cent. in north Atlantic states, 100 per cent. in middle western states, and 230 per cent. in southern states, according to statement from the Chamber of Commerce of the United States.