tem drawn in a plane acquires three dimensions by moving, but this objection is merely specious. I propose to show that in considering only atoms in one plane we arrive at results in contradiction to the facts; it is necessary therefore to change at least for the chemistry of carbon.

Let us consult the simplest graphic method, that which leads to the lowest number of isomers: Let us represent the four affinities of each carbon atom by four lines, drawn in a plane, perpendicular to each other; let them be $R_1$, $R_2$, etc., of monatomic groups:

Then a compound of the formula $C(R_1)_4$ would be represented by fig. 1, and would not admit of isomers; it is the same with the class of compounds shown by the formula $C(R_1)_3 R_2$ (fig. 2);

But $C(R_1)_2 (R_2)_2$ and $C(R_1)_2 R_2 R_3$ allow each two images (fig. 3 and 4) of two isomers;

Likewise with the formula $C(R_1 R_2 R_3 R_4)$ we can construct three symbols, shown in figs. 5, 6 and 7.

In summation, we have a number of isomers resulting from the simplest hypothesis, concerning the development of formulas in one plane; the number is evidently much greater than those known at the present time; every other attempt would give more of them.

Second drawback: Let us take the formula $C(R_1)_3 R_2$ represented by fig. 8; it is evident that the group $R_1$, shown by $(R_1)_b$ ought to have different properties from that indicated by $(R_1)_a$: that is to say that in a compound such as methyl chloride one with three atoms of hydrogen ought to have a special character; yet the result does not justify it; let us then leave these formulas to look at those which result when we consider them in space.

In imagining the affinities of the carbon atom, directed toward the apexes of a tetrahedron, whose center would be occupied by the atom itself, theory is in accord with fact. Indeed no one has ever caught a hint of the existence of isomers for the compounds represented by the formulas $C(R_1)_4$, $C(R_1)_3 R_2$, $C(R_1)_2 (R_2)_2$ and $C(R_1)_2 R_2 R_3$; only in the formula $C(R_1 R_2 R_3 R_4)$ one case of isomerism appears; it exhibits the difference of figs. 9 and 10; in fact if one supposes himself standing on the line $R_1 R_3$, his head at $R_1$, looking at $R_2 R_4$, $R_2$ would be turned to the right (fig. 9) or to the left (fig. 10) of the spectator, in other words: *In the case where the four affinities of the carbon atom are satisfied by four groups different from one another, we can have two and only two different tetrahedra, which are mirror images one of the other, and can never doubt this idea, namely, that we are dealing with two formulas isomeric in space.*

### The Asymmetric Carbon Atom

The main result of our hypothesis has been to predict many isomers, which present theory cannot do, in connection with compounds containing one or more asymmetric carbon atoms.

Indeed it can predict that isomerism which, as we have seen, does not appear in any striking difference in chemical properties; there is indeed great similarity in reactions, so that it is known in general under the name of physical or geometric isomerism.

It is evident that differences will be discovered the more readily the greater they are; so that descriptions of isomerism or the identity of such bodies are still very new.

The work of M. Wislicenus on the lactic acids has interested me very much, also the discussion between his pupils MM. Friedel and Langermarck over the existence of two or three ethylene iodobromides. Here we are dealing actually with compounds containing asymmetric carbon atoms:

$CH_3.CH(OH)\ CO_2H$ and $CH\ Br\ I\ CH_3$

Although the chemical properties of the isomers in question resemble one another so much, they have not the same physical properties. The way in which these bodies behave in respect to polarized light interests me especially; I have indeed recently reached the following conclusion:

*Every carbon compound, which in solution effects a deviation in the plane of polarization, possesses an asymmetric carbon atom.*

I have concluded that we find here a proof in support of my hypothesis, for the rotary power which bodies in solution possess arises from the kind of molecule, and not from a special grouping of them; so the differences in this property ought to relate to those in the construction of the molecule.

*Science News Letter, June 6, 1931*



ENGINEERING

# Government Tests Show That Gasoline Dopes Are Useless

GASOLINE dopes sold to be added to motor fuel were found in an extensive series of U. S. Bureau of Standards tests to be valueless in improving any feature of engine performance.

Conclusions drawn by Dr. H. C. Dickinson, chief of the division of heat and power, show that such dopes, exclusive of well-known knock suppressors which are sold mixed with the gasoline, cannot be expected to improve starting, decrease crankcase dilution, or prevent vapor lock. Some 150 dopes were tested.

"As the result of the normal failure to reach perfection," Dr. Dickinson explained in a report to the American Chemical Society, "the motor vehicle offers a new field for the former dopesters of human ills. In fact, the psychological factors which have played such a large part in the distribution of drugs and medicines are equally potent in their effect on the marketing of fuel dopes.

"The starting characteristics of a fuel cannot be revolutionized by the addition of any foreign material in amounts much less than one per cent. The completeness of evaporation also, like the ability to start, is controlled by the general volatility of the gasoline and cannot be appreciably affected by the addition of material in small amounts.

"Vapor lock or the stoppage of the engine due to interference with the normal fuel feed has been increased recently by the high initial vapor pressure of cracked and natural-gas gasolines. No dope has been proposed to remedy this fault."

With regard to knock prevention, Dr. Dickinson said that some of the anti-detonants are essentially fuel improvers. Among these the best known are iron and nickel carbonyls and organic compounds of lead, selenium and tellurium. Tetraethyl lead, the anti-knock agent that has found general application, is sold only mixed with gasoline.

*Science News Letter, June 6, 1931*

AERONAUTICS

# Scientists Fortunate to Return From Region of Black Skies

PROF. Auguste Piccard and Dr. Charles Kipfer, whose balloon rose to a height reported to be over 50,000 feet on May 28, have been more fortunate as well as more successful than previous balloonists, many of whom have been martyrs to the conquest of the atmosphere.

The record balloon ascent in November, 1927, by Capt. Hawthorne C. Gray of the U. S. Army ended fatally for him. After several previous narrow escapes, Capt. Gray reached 43,000 feet but, accidentally cutting his oxygen tube, died from suffocation before reaching the ground at Sparta, Tenn. On a previous ascent he lost consciousness only to find himself falling at about a thousand feet per minute. Throwing ballast overboard frantically he fortunately landed on some telegraph wires without harm. On another occasion he had to use a parachute to save his life.

The record for heavier-than-air machines is about the same figure. A height of 43,168 feet was reached by Lieut. Apollo Soucek of the U. S. Navy.

A new method for finding high altitudes and a record for two men was the outcome of a more recent and fortunate flight with an airplane, piloted by Capt. St. Clair Street of the Army Air Corps. Photographs of Dayton, Ohio, were taken from this machine by Capt. Albert W. Stevens at a height of 40,000 feet.

### Lightning Hazard

Lightning, another hazard of high flying balloons that depend on inflammable hydrogen instead of the helium such as used in the airship Los Angeles, caused the deaths of Dr. C. L. Meisinger of the U. S. Weather Bureau and Lieut. J. T. Neeley of the Army Air Service in 1924 over central Illinois. In making a series of balloon flights to learn the behavior of storms at great heights, Dr. Meisinger and Lieut. Neeley were finally the victims of a thunderstorm that set fire to their balloon, an accident they had feared but luckily escaped in previous ascents.

The height reached by the Piccard balloon is only half as great as the 20 miles reached by small unmanned balloons.

There is some doubt as to whether anything of value will be added to our knowledge of cosmic rays as a result of the flight. In 1922 Dr. Robert A. Millikan and Dr. I. S. Bowen of the California Institute of Technology sent their cosmic ray electroscopes to a height of nearly ten miles, slightly higher than the reported Piccard record.

Dr. W. J. Humphreys of the U. S. Weather Bureau stated that the two scientists, imprisoned within their aluminum globe, could hardly expect to observe anything by means of the instruments fastened to the outside that has not already been made known by registering apparatus sent aloft on free balloons that have ascended to much greater heights than that reached by the German bag.

In reaching their record-breaking height, the two venturers passed through all the weather there is, for all clouds, as well as the highest winds, are found below the ten-mile level that marks the top of the "troposphere," or region of really active air. Above this, in the "stratosphere," the sun shines brightly in a black sky, the winds are constant but moderate, and the temperature drops to a level of about 70 degrees below zero Fahrenheit at the 50,000-foot mark.

The Piccard ascension was the first balloon flight in which a sealed cabin has been used.

Experts believe that the stratosphere explored by the aluminum globe offers the best hope for fast-flying airplanes as the resistance of the air at these heights is very small.

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