scene facts about the stages by which automobile designers arrive at their final model were revealed by George J. Mercer, consulting body engineer of Detroit.

Here is an approximate recipe for producing next year's motor:

Conservative Plus Radical

Take one part each of conservative body designer and artist with radical design tendencies. Let them produce drawings of what they would like the new car to look like on the assumption that the factory can produce anything. Then add two parts "practical" engineers who can season the extreme designs with knowledge about tool and die costs. Mix in a dash of public opinion as determined by questionnaires and test the mixture on a small group of executives.

Strange as this procedure may seem, it is one method of arriving at the new models. Inherent difficulty is that few people, either in the industry or out, have any concrete ideas of what they want. In the main they can only tell what they don't want, Mr. Mercer indicated.

Napoleon's comment that the only thing worse than an army with a poor general was an army with two good ones is equally applicable to body design, said Mr. Mercer. Final decision on the body style choice must be left to a small committee which may well have one woman member.

Final step in production is spreading the work out as widely as possible so that secrecy may be preserved. The idea is that while many people may know a few details it will be difficult for a competitor to get enough pieces of information together to make sense.

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ORNITHOLOGY

First Adventure of Young Robins Pictured

See Front Cover

JUST a couple of young robins, big enough to leave the nest but not quite ready yet to "go it alone" in the wide world provide the subject for the front cover illustration of this week's SCIENCE NEWS LETTER. They hang onto their twig with all the grip there is in their small toes—for there may be a cat on the ground. The photo is from the camera of Cornelia Clarke.

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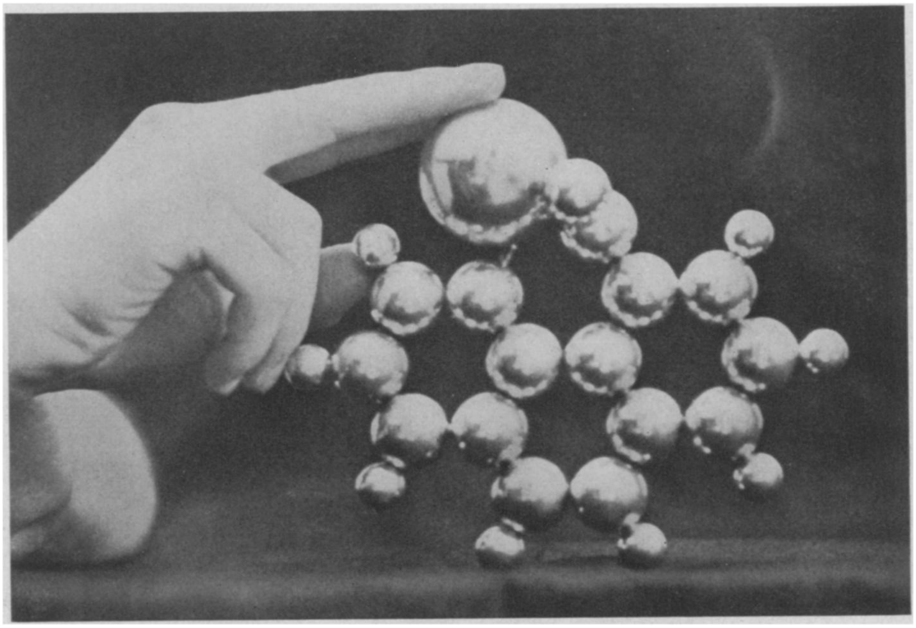

MODEL OF COMPLEX MOLECULES

With aluminum spheres whose relative sizes accurately picture the sizes of the different atoms chemists can now foretell whether they can build up complex organic molecules. Above, the chemist's hand is trying to add a large iodine atom to an already complicated molecule. Because the iodine atom is so big, it will not join on to the model at its proper place. Thus the chemist knows he cannot prepare the compound known as 5-iodo-4-nitro-phenanthrene, except perhaps in an indirect way. Dr. R. E. Steiger of Swarthmore College developed the molecular models.

CHEMISTRY

Large Models of Molecules Predict Chemical Facts

By DR. W. E. DANFORTH, Bartol Research Foundation of the Franklin Institute

A WATCH designer, in order to facilitate his work, may construct a model several times larger than the finished time-piece will be.

How convenient it would be for the organic chemist if he, likewise, could enlarge the molecules with which he deals to a size of several inches. Instead then of vainly attempting for months to prepare a certain compound, he could have seen at the outset that the method he was using could not possibly lead to the desired result.

The organic chemist is always anxious to know just how closely atoms or groups of atoms, appearing in the molecules of a compound, approach each other in space. With this knowledge he could foresee whether or not certain phenomena would take place.

To represent organic molecules correctly, models should be composed of spheres made to the scale of the atoms with a properly chosen magnification. Moreover, the spheres should not be separated by rods as are those in the old-type models.

This has been fully realized by Dr. Robert E. Steiger of Swarthmore College. His "Organospheres" are 172,410,000 times the actual size of the nonmetallic atoms one is most likely to find in organic substances. Made of solid aluminum, they can be connected to each other, at specific points ("valence points") on their surfaces, by means of pins which are no longer visible once the connection has been effected.

To speed up construction of the desired models, complete sets of Organospheres contain assemblages of two or more spheres corresponding to the groups of atoms most frequently occurring in organic compounds.

George A. Bourdelais of the Engineering Division of Swarthmore College deserves great credit for having successfully solved the serious technical difficulties encountered in the making of the Organospheres, thus having provided organic chemists and teachers with an effective tool for research and demonstration work.

But how, one may ask, do scientists know how large the atoms are? This is accomplished with X-rays by examining the reflected pattern produced when a beam of X-rays is shot into a crystal of the substance in question. In addition, the models themselves may furnish considerable information as to the sizes of real atoms. For, if certain molecules are known to exist and to behave in a certain way, the models may show that this behavior is only possible when the sizes of some of the atoms lie within narrow limits.

In this way, Dr. Steiger was able to assign to the hydrogen atom attached to an aromatic ring a radius of 0.00000000173 inches (0.44 Angstrom units). Several months later, an English scientist, Dr. P. L. F. Jones, obtained exactly the same value by a more direct method.

Dr. Steiger is now engaged in research to prove that several rather simple compounds must be mixtures of optically active modifications because they are not at all symmetrical in structure as is generally believed.

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From page 359

Over in the engine research laboratory the visitor stands speechless in the face of roaring engines. Here is the newest thing in Diesel engines, which weighs no more per horsepower developed than do the best internal combustion engines now in use.

Study Diesels

In the not-too-far distant future it may lead to the design of Diesel engines for airplanes and airships; the latter if the nation decides to go into the business of building them again. In the meantime the research engineers of the N.A.C.A. are studying Diesels from all possible angles to be ready if and when matters of policy are decided by government officials at Washington.

Typical of the advanced research is the world's only glass engine cylinder, whose walls are accurately ground to within a ten-thousandth of an inch, into which the scientists can peer and watch what really happens when the air and fuel surge into the firing chamber. Slow motion "movies" of these cylinder eddy currents are made when the engine is turning over at 1,500 revolutions per minute. Actual firing of the charge does not occur, but already much has been learned about the proper design of fuel nozzles and other problems.

To Prevent Roll

A new type of airplane wing section has been developed which avoids the hazards of wing-tip stalling when a plane tries to climb too fast. In the ten-foot diameter wing tunnel the N.A.C.A. scientists show the visitors visible proof of this development.

Tiny silk threads are mounted on the upper wing surfaces of an airplane model. In level flight the airstream flows smoothly over the wings and the threads lie flat. Then a concealed robot pilot mechanism within the model tilts the plane upward as in a steep climb. Immediately the threads near the wing tips start to flutter, showing that lift has been lost on those surfaces.

The torque created produces a roll which the controlling ailerons on the wings may not be able to counteract. The visitor shudders and is glad the model is not a real plane with him in it.

But then the new type N.A.C.A. wing is placed on the model and the same experiment performed. This time stalling, as shown by the fluttering silk threads starts near the body of the airplane instead of near the wings. Instead of rolling round and round the model merely oscillates slightly and only a vigorous push on one wing sets up the roll. As soon as the robot pilot in the model restores the controls to the normal position the plane comes out of its rolling flight.

Highly technical but vitally important for still higher airplane speeds are studies of what aeronautical scientists call "skin friction." This is the resistance of an airplane's surface even after all protruding parts have been suitably streamlined. Skin friction depends on the presence of a turbulent flow of air across the wings instead of a smooth flow. If the turbulent flow could be overcome on the wings of a large modern transport plane, the drag of the wings, which is ordinarily about 550 pounds, could be reduced to 100 pounds drag instead. The gain in speed, greater pay load and all the other factors whose improvement would come with reduced "skin friction" drag, offer a major airplane research objective.

Using model cross-section of wings and smoke, N.A.C.A. scientists are now studying the particular conditions which turn the smooth flow into the dragging turbulent flow. Here again wind tunnel research is vital.

So multitudinous are the research projects at Langley Field that the visitor is truly amazed. The significance of much of the work cannot immediately be grasped. Some of it, of military necessity, cannot be shown. But from it all one goes away with a wholesome respect for little-mentioned research which has aided materially in bringing American aviation to its present high stage of development and which—skill and appropriations permitting—will continue to keep it there.

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MEDICINE

Process for Making Milk Safe for Allergy Patients

A MILK which sensitive, or allergic infants and grown persons, who break out into an eczema-like rash every time they drink ordinary milk, could imbibe without any ill effects is described in a patent (No. 2,036,404) granted to W. O. Frohring, of Shaker Heights, Ohio.

The milk is pleasant, appetizing and agreeable to take, especially when sweetened with sugar, says the inventor, who has assigned his patent to the S.M.A. Corporation, producers of special baby milks.

Whole-milk, skim-milk and cream, he claims, may all be made non-allergic by his unique method. The non-allergic milk can take the place of egg yolk in making mayonnaise, states the patent, and egg-allergic persons who are sensitive to mayonnaise made with egg yolk can eat to their hearts' content of the non-allergic product.

Proteins contained in milk, such as casein, albumin and globulin, are blamed for inducing symptoms in allergic infants and adults. Giving milk a special heat treatment, the inventor has found, seems to eliminate or reduce the allergy-inducing tendencies of these proteins.

In applying this heat treatment, ordinary pasteurized milk is first poured into containers which are then sealed to keep air out. The sealed milk is then heated to a temperature of between 240 and 242 degrees Fahrenheit for about two hours. That is all there is to the process. The treatment kills spores and bacteria, and more important, without any apparent breakdown of the proteins, it changes them so that the milk becomes safe for milk-allergic persons to drink.

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