

# The Graphic Laboratory of Popular Science

By Dr. Thomas M. Beck



Helium for Divers

(Foster C. Stanfield photo, © 1937 by Milwaukee Journal.) Max Nohl is helped out of his special diving suit after setting a world record for suit dives by going down 420 feet to the bed of Lake Michigan off Port Washington, Wis. Nohl went 114 feet farther down than Frank Crilley, navy diver, who previously held the record at 306 feet.



(Acme photo.) Yves le Prieur, Paris inventor, demonstrates a heated diving suit in an aquarium tank. The invention is designed to reduce discomfort suffered by deep-sea divers.

A FEW weeks ago Max Nohl, a professional diver, descended 420 feet below the surface of Lake Michigan. This dive, an experimental one, was of scientific interest for two reasons. It is the greatest depth yet reached by a man in a diving suit, and hence the pressure was the greatest to which the human body has yet been subjected. In addition, the dive was the first official one made with the use of a synthetic atmosphere containing helium.

Helium is chiefly noted for its lightness and its lack of chemical reactivity. Its use in diving, however, is based upon a less well known but equally striking property, namely, its abnormally low solubility in water.

The solubilities of gases in water vary over a wide range. One volume of water will dissolve several hundred volumes of certain highly soluble gases such as ammonia or hydrogen chloride; extreme solubility of this type, however, is more of the nature of a chemical combination between the gas and the water. At the other extreme are the solubilities of such gases as hydrogen, oxygen, nitrogen, and helium. A volume of water dissolves only a tenth of a volume of nitrogen and slightly over a hundredth of a volume of helium.

These solubilities are those found at body temperature and atmospheric pressure. The mention of pressure is important. In the cases of the slightly soluble gases the solubility is directly proportional to the pres-

sure; that is, if the pressure doubles, twice as much gas (by weight) dissolves.

The pressure at any point below the surface of water is equal to the weight of a column of water above that point. The total pressure exerted upon a diver at a depth of 420 feet is 13.4 times that of the atmosphere; in other units, about 195 pounds pressing on each square inch of surface. The facts that this pressure extends evenly over the entire body surface, and that solids and liquids are practically incompressible, protect the firmer tissues of the body from anything more serious than temporary discomfort.

However, pressures of this magnitude would quickly crush a man's chest unless the air within the lungs were increased in pressure sufficiently to balance the outside pressure. Such pressure increases the amount of nitrogen dissolved in the blood by more than ten times. This dissolved gas does no harm so long as it remains dissolved, but if the pressure is quickly reduced by a too rapid return to the surface, the gas bubbles out of the blood, exactly as gas escapes from a suddenly opened bottle of soda water.

The mechanical destruction of tissues resulting from the formation of nitrogen bubbles throughout the body results in a painful condition known as "the bends," frequently resulting in permanent paralysis or death. The only way of combating this ailment consists of placing the victim in a compression chamber and subjecting him to the former high gas pressure. This drives the nitrogen back into solution, and a gradual reduction of the pressure to atmospheric permits the slow release of this excess gas through the lungs.

The synthetic atmosphere breathed by Diver Nohl during his record-making dive had the nitrogen normally present in air replaced by helium. Since helium is barely a tenth as soluble as nitrogen, it follows that the worst damage it can possibly do in cases of too rapid decompression is correspondingly reduced. In addition, there is less chance of helium bubbles forming.

An attack of the bends can be prevented by returning the diver to the surface very slowly, so that the nitrogen has time to escape gradually through the lungs. This necessary precaution, however, leaves less time in which the diver can work. One of the advantages of replacing nitrogen by helium is the possibility of reducing this time for decompression.

It will be noticed that no men-

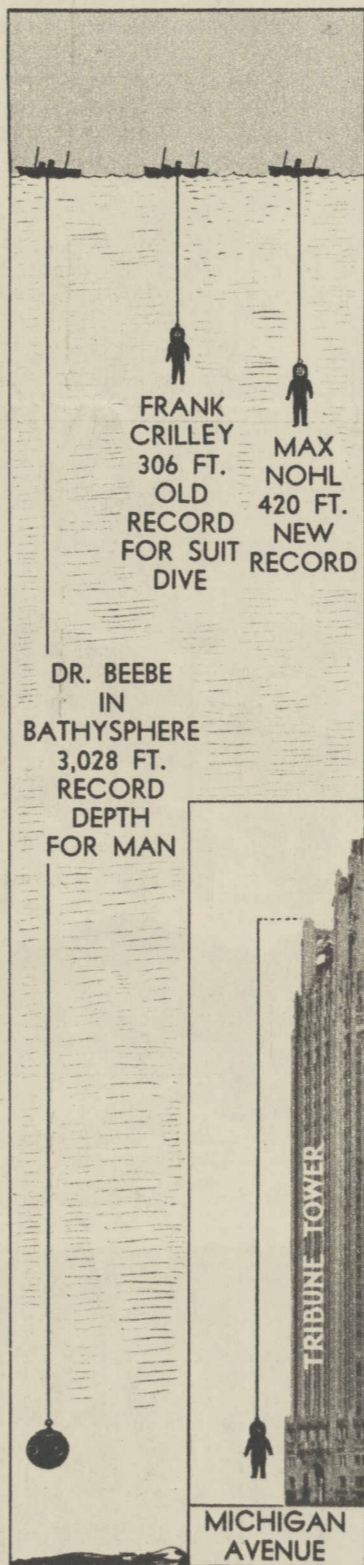


Figure 1: Comparison of depths reached by Nohl, Crilley, and Dr. Beebe, who went farther under water than any man, but in a massive ball called a bathysphere. Figure 2: Nohl would just about have reached Michigan avenue if lowered his record distance from the flying buttresses of Tribune Tower.

tion has been made of the effect of pressure on the two physiologically important gases of the air, oxygen and carbon dioxide. The solubilities of these two in distilled water are subject to the same laws that govern nitrogen and helium. Their solubilities in blood, however, are the results of complex chemical reactions with hemoglobin and the dissolved mineral salts of the blood. Consequently these two gases do not form bubbles when the pressure is quickly reduced.



(Acme photo.) A diver demonstrates the use of a decompression chamber for curing "the bends," a disease suffered when divers are brought too quickly to the surface. Dr. Beck's article tells how use of helium makes quick changes of pressure less dangerous.

# Mostly About Dogs

By BOB BECKER



Mimi Morris and Freckles, her springer spaniel, are typical of the close companionships that exist between countless American boys and girls and their pet dogs. Mimi is the daughter of Maj. Paul H. Morris of the U. S. army. The springer spaniel, a hunting dog that handles both feathered and furred game, has such an affectionate, gentle disposition that it makes a good pet in the home.

IF DOG OWNERS in the United States enjoy the game of trying to keep New Year resolutions they should have no trouble finding dog problems to be covered by their 1938 resolutions. After talking with our dogs to find out what they have on their minds, thinking about dog shows and field trials, and then considering dog laws and dog problems in towns and cities, we offer a few suggestions on New Year's resolutions for 1938—a year which again should see marked advances in the world of dogs.

For all of us who own dogs: Resolved, That we will not let our dogs run the street at will, as it is not good for the dog, for our neighbors, or for the community. A second resolution might deal with support of the dog catcher who picks up stray dogs,

## Resolutions for Dog Owners

magazine so, that there will be more news of dog activities everywhere.

For the owner of a new puppy: Resolved, That I will not listen to advice from everybody on how to take care of my puppy. There is so much misinformation going the rounds about dogs that it's a wonder some puppies ever live six months. In this resolution we'd like to bring out facts like these: A puppy needs meat in its diet. Milk does not cause worms. On the contrary, it's a valuable food for the puppy.

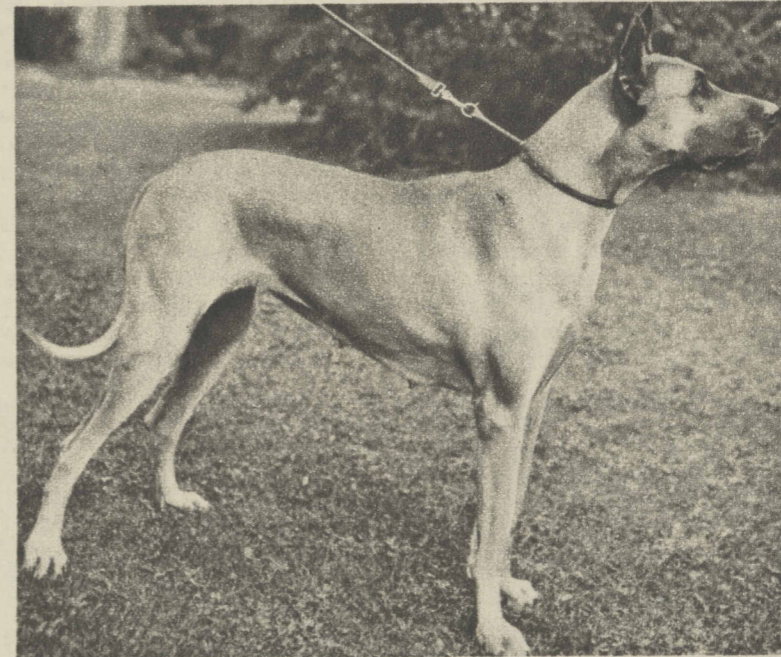
that I get a break from my owner and somebody makes him teach me good manners. In many cases a dog that does not mind, makes a nuisance of itself, and has no manners isn't as much to blame as the owner. A dog enjoys being trained and pleasing its master. All it needs is guidance and attention to possess good manners.

## DOG NOTES

A reader questions a statement made in this column about the term "Pomeranian Spitz." She says: "In your paper you stated that there was no dog like the Pomeranian Spitz. But the encyclopedia mentions that name. Who is right?"

The American Kennel club recognizes the toy dog, the Pomeranian, which is one of the best known of all the toy breeds. There is also a breed of dogs known as the Spitz, although this breed is not recognized by the kennel club. At one time there was a breed called the Pomeranian Spitz in Germany, and from these large dogs emanated our Pomeranian of today. Germans now term this large dog the wolf spitz, however, so the name "Pomeranian Spitz" is not used even there.

Pug dogs are not one of our most popular breeds today, but they are almost as popular now as they were fifty years ago, when the breed was supposed to be having its big days. The American Kennel club stud book registered 144 pugs in 1889, 118 in 1936.



The Great Dane, once bred to hunt wild boars in Europe, is one of the most distinguished varieties of the giant type of dog. There are several standard colors for Great Danes. This one, Baula of Braetorn, is a fawn.

since rabies commonly is perpetuated in our stray dog population.

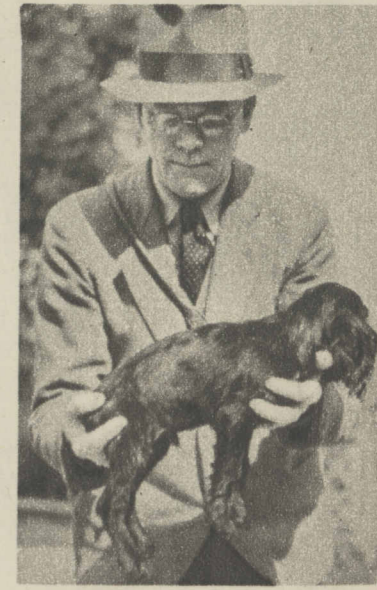
For clubs that promote dog shows: Resolved, That we will stress programs that have wide entertainment value to the average dog owner, so that the shows will be more entertaining and educational and less like a lodge meeting. Among the features which might be emphasized are motion pictures of dogs, more exhibitions by trained dogs of various breeds, more attention to children and obedience classes, and use of a loud-speaker and announcer at the ring to tell about the breeds being judged, their origin, the decisions of the judges as to winners.

For the American Kennel club: Resolved, That we will pay more attention to the dog activities west of the eastern seaboard, do more to keep in touch with clubs and groups in the west, open one or more offices west of New York, and devote more thought to field trials—their development and rules for running them. And a second resolution: That we will change the club

immunization against distemper is valuable insurance for your puppy.

For you and me and others who own dogs: Resolved, That I will do my part to secure sane, sensible laws affecting dogs and dog ownership. I will assume full responsibility for dog ownership; will be tolerant of those who own other breeds and are just as keen about them as I am about the one which interests me. (There are scores of recognized breeds; all have qualities which are worth while.) And I will support the local dog organization.

For the dog that runs after automobiles and won't come when called: Resolved, That I will turn over a new leaf during 1938, but only on the condition



(Tribune photo.) Here is the safest way to handle a small puppy. Notice that one hand is under the front of the pup, holding its legs in, not out. The other hand supports the hindquarters.



• For attractive offers of dogs, turn to the Dogs, Cats, Birds, and Poultry columns in the want ad section of today's Tribune.