PHYSIOLOGY

Artificial Blood in Dogs Shows Red Cells Guard Hemoglobin

THE RED CELLS of the blood in man and the domestic animals act as guardians of hemoglobin. Their chief function is to prevent the escape of this precious stuff on which the body depends for its supply of oxygen.

These are the conclusions reached by a group of scientific investigators at the University of Tennessee College of Medicine in Knoxville, Drs. William R. Amberson, Arthur G. Mulder, Frederic R. Steggerda, James Flexner and David S. Pankratz. A preliminary report of the research appears in *Science*.

In vertebrates, the class of animals to which belong man and other animals having a backbone, hemoglobin normally occurs only inside the red blood cells. But in some spineless or invertebrate animals, the oxygen-carrier is found in solution in the circulating blood. The general assumption was that in the vertebrates hemoglobin could not carry on its function of oxygen transportation when it got outside of the red cells of the blood.

The University of Tennessee research team has found that this is not the case. Hemoglobin continues to carry oxygen to the tissues quite successfully when it is in solution instead of inside red blood cells. Dogs and cats lived and carried on normal activities, such as walking, running, seeing, and hearing when the blood in their veins and arteries was replaced by a synthetic blood mixture containing hemoglobin in solution instead of inside red blood cells. They showed no signs of lacking oxygen or of respiratory failure for a period of several hours after the synthetic blood mixture had replaced entirely their own blood.

However, the hemoglobin began to escape from the blood and was excreted from the body like waste products. When the supply had been exhausted, the animals died from oxygen lack and respiratory failure.

Such a disastrous escape of hemoglobin from the blood stream is prevented by the red cells, which hold the hemoglobin securely within membrane walls through which the hemoglobin cannot pass.

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ECONOMICS

Crop Limitation Saved Colonial Tobacco Planters

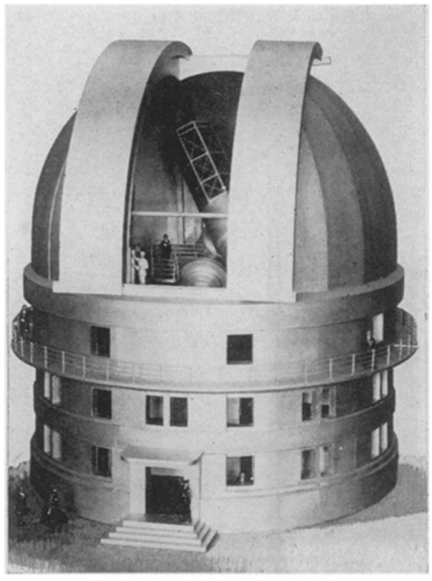
CROP LIMITATION is no new thing under the sun. In the pre-Revolutionary American colonies of Virginia and Maryland it once became necessary to save the tobacco planters from the consequences of the too-rapid expansion of their industry by establishing a maximum crop for each plantation.

The story of this early American crop limitation scheme was turned up by Dr. Rexford G. Tugwell, Assistant Secretary of Agriculture. In the early eighteenth century the over-production of tobacco in Virginia and Maryland, in the face of a market that expanded only slowly, was bringing hardship to the planters and to the entire community. So legislation was adopted aiming at an adjustment of supply to demand.

In that early day, said Dr. Tugwell, a man did not always know how much land he had, but he did know how many slaves he had; so each planter was restrained to setting out 6,000 tobacco plants for every Negro between 16 and 60 years of age on his plantation.

Another early example of crop limitation, this time in France, is cited by Dr. Tugwell from that Bible of individualistic economics, Adam Smith's "The Wealth of Nations." Early in the eighteenth century the grape growers, burdened with an over-production of grapes, obtained a government order prohibiting the planting of new vineyards and the renewal of old ones.

Science News Letter, August 19, 1933



FOR MOUNTAIN TOP

How the McDonald Observatory 80-inch telescope will appear when it is erected on a Texas mountain peak within the next few years. Model by Warner and Swasey Co. who are building the telescope. The telescope, as pictured on the cover, is shown here housed under its dome.

ASTRONOMY

Construction Begun On 80-Inch Texas Telescope

See Front Cover

THE GIANT 80-inch reflecting telescope that will spy upon the stars from McDonald Observatory to be erected on a peak of Davis Mountains, Texas, is now under construction.

A contract for the telescope has been approved by the University of Texas board of regents, and Warner and Swasey Company of Cleveland are the builders, it has been announced by Dr. Otto Struve, joint director of the Yerkes and McDonald Observatories.

Universities Cooperate

McDonald Observatory, with its 80-inch telescope which will be exceeded in size only by the present 100-inch Mt. Wilson reflector and the projected 200-inch California Institute of Technology telescope, is a joint undertaking of the University of Texas and the University of Chicago. With a bequest left by William J. McDonald, the University of Texas will erect and maintain the observatory, while the University of Chicago utilizing the experience of its Yerkes Observatory at Williams Bay, Wis., will staff and operate the new observatory.

A kind of glass that has a slightly smaller coefficient of expansion than pyrex glass will be used by the Corning Glass Works of Corning, N. Y., in casting the big 80-inch diameter mirror.

The mounting of the telescope will be of the cross-axis type, but the usual declination axis is replaced by a large bearing. Great adaptability is planned as the telescope will be capable of being used in the ordinary Newtonian form, in the Cassegrain form and in the Coudé form.

When operated in the Newtonian form, the image of the star or other heavenly object focused by the giant mirror is caught by a small mirror or prism and thrown to the side of the telescope tube near its top, where it is viewed through an eye piece. In the Cassegrain form, a small convex mirror placed at the focus reflects the rays back through the tube into a small hole in the big mirror and the observer looks directly at the stars as with a lens or refracting telescope. The Coudé arrangement uses a number of mirrors that bring the rays to a comfortable, fixed location where delicate apparatus may be used.

Constant Temperature

A constant temperature room will be provided at the lower end of the polar axis. The principal focal ratio will be 1 to 4, the focal ratio at the Cassegrain focus will be 1 to 15, and at the Coudé focus approximately 1 to 20.

The counter weight, which in other telescopes is attached to the declination axis, is moved in the McDonald telescope towards the upper end of the polar axis where it will not interfere with the hydraulic hoists operating the two platforms for the Cassegrain arrangement.

Mechanical details of the new telescope were worked out by E. P. Burrell, Warner and Swasey Co. director of engineering, while the specifications of the telescope were prepared by Drs. George Van Biesbroeck, Frank E. Ross, G. W. Moffitt and others of the Yerkes Observatory, with the advice of many other astronomers.

The photograph on the cover is a model of the McDonald Observatory 80-inch telescope with its novel elevator-like platforms. How the telescope fits in its housing and dome is shown by the picture on the preceding page.

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Elephants are very short-sighted.

BIOLOGY

Consider the Size Of The Smallest Living Things

Some, Not Seen Because Shorter Than Light Waves, Are Measured by the Size of Holes They Pass Through

WHILE PHYSICISTS are hounding their ultimate particles of matter down into dimensions so small that they hesitate any longer to call them particles at all but prefer to think of them as mere loci of energy, almost as mathematical points without real magnitude, biologists too have been busy trying to find out how small a thing can be and still be alive.

The biologists can never beat the physicists in a contest for champion diminutiveness, for to be alive at all an organism must have at least half-a-dozen elements stirred into its makeup, and as a rule quite a few atoms of each element. So the smallest possible living thing looms above the smallest possible particle of the physicist rather like a planet alongside a pea. Nevertheless, biologists are getting a lot of fun out of their chase—serious fun, to be sure, because the ultimate smallness possible to such a thing as a disease virus, that of smallpox, for instance, obviously has its practical significance in terms of human life and even cash values.

The Journal of Physical Chemistry recently published in tabular form the principal measurements of extremely small living things, or things that seem to be alive, as determined by a good many research workers. Most of these ultimate minima of living substance are either the invisible viruses of diseases or the equally invisible bacteriophages that are the diseases that kill bacteria themselves.

They have been measured by various more or less indirect means, but principally by the known sizes of the pores in filters through which these organisms (if they are organisms) can pass. The smallest of the bacteriophages in the list passed through a 20-millimicron hole, and the smallest of the virus particles through an opening half again as wide. From these minutenesses the living particles range up to 200 to 250 millimicrons, which is the size range of certain apparently living spheroids concerned in pleuro-pneumonia.

Now a millimicron, the ultra-microscopist's unit of measure, is a thousandth of a micron. A micron is a thousandth of a millimeter, and a millimeter is a twenty-fifth of an inch. One thousandth of one thousandth of one twenty-fifth of an inch figures out to one twenty-five-millionth of an inch; so these minutiae of life are obviously pretty small.

They will never be seen by ordinary visible light, because the shortest violet wavelength to which the human retina will respond is about 400 millimicrons long. The biggest of them, the 250-millimicron ones, are comfortably within the ultraviolet wavelength range, and so can be photographed with a special quartz-lens microscope set-up. But the littlest ones can be reached only by indirect means of measurement.

Yet these inaccessibly invisible living things, some of them smaller than the known dimensions of non-living molecules, can get at us, and do get at us, with no difficulty at all. The viruses afflict us with such ills as chicken-pox and influenza, apparently; they give our livestock foot and mouth disease; they ruin our plant crops with leaf mosaics. The bacteriophages fight on our side, against all manner of microbes, from boils to the plague. So it will pay us to pursue our acquaintance with them, even if we never get to look squarely at them.

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GENERAL SCIENCE

Roosevelt Appoints Science Advisory Board

PRESIDENT ROOSEVELT has rallied a group of eminent scientists as a Science Advisory Board to aid the government in coping with scientific problems which the new era in American development will bring. The new board consists of men who have not only made reputations for themselves as leaders in their respective fields of re-