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.

Science News Letter, August 19, 1933

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.

Science News Letter, August 19, 1933

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-