stage of its development that applied physics was in the middle of the last century when, although the principles underlying the telegraph and telephone had been developed, the real wonders of our age, such as radium and the wireless transmission of the voice and sound, had not even been imagined. With the present rapid application of the recent great discoveries of physics and chemistry to the solution of problems of disease and other biological phenomena, it is not impossible that the next decades will witness discoveries relating to the prevention and cure of disease which will far transcend the discoveries of the past half century.

Is it not stimulating to us who are interested in hospitals as instruments for the furtherance of human welfare that these institutions are now permitted to share in the great advances that are being made and that are likely to be made in the future? Until recent years, while the hospitals were appreciative of the contributions which their physicians made to medical progress, yet, as organized institutions, the hospitals themselves played little part in these advances; but now they stand beside the universities and the scientific institutes in educating physicians and in advancing medical science.

Funds and resources must of course be available to exercise properly these functions of education and research. But is it not likely that, when the public fully understands that hospitals, such as this, are engaged not merely in caring for a limited number of the sick poor, but are contributing to the relief of suffering the world over by making better doctors and by increasing knowledge concerning disease, funds for this work will pour into the hospital coffers in greatly increased amounts? "If the public wants good doctors it must help to make them."

I realize that it is like "carrying coals to Newcastle" to reiterate these things which you have already considered for yourselves and about which you have made such wise and far-reaching decisions. The results obtained here in the way of new discoveries and in the improvement of medical education, in the increased service of the hospital to the community, in the ever increasing reputation of your institution must make you very proud and very ambitious for even greater things. The New Haven Hospital has always stood in the front ranks. Its past is an honorable and glorious one. At times its luster may have been dimmed owing to its proximity to a famous university, but in recent years in the great universities the world over the medical faculty has acquired increasing importance. In medical education in this country, the hospital is playing, and will play, an important rôle.

But just as the success of the university is dependent upon the men who comprise its faculty, so the accomplishments of the hospital depend upon the abiilty and energy of the physicians working within its walls. The organization and the equipment may offer opportunities, but the success of the hospital will really depend upon the character of the men who are attracted to join in its activities and upon the breadth of the spirit of service that pervades its atmosphere.

May this hospital in the future, as in the past, have the services of the greatest men in the medical profession. May they be guided by the same broad humanitarian spirit as have their predecessors and may the next centennial bring as marked cause for satisfaction to your descendants as this first centennial has brought to you. "Prosperity to the New Haven Hospital and health and ease to its poor patients."

RUFUS COLE
HOSPITAL OF THE ROCKEFELLER INSTITUTE

THE SUBSIDENCE NEAR SHARON SPRINGS, KANSAS

ON the morning of March 9, 1926, a certain rancher, living about five miles east of the little town of Sharon Springs on the plains of western Kansas, chanced to see across the fields a dun-colored cloud of smoke. Hasty investigation revealed a newly formed, great yawning hole at the edge of the gently rounded bluff that here looks down on the dry sandy flat of Smoky Hill River. The cloud was dust. Excited word was broadcast by the press that the bottom was dropping out of Smoky Hill River, that a volcanic explosion of some sort was in full blast, or maybe a great gas blowout was in process of blowing.

According to reliable report the opening was at first something over fifty feet in diameter and appeared to be some hundreds of feet deep. Two streams of water from the underflow of Smoky Hill River were cascading into the depths, sounding distantly on rocks below.

On March 11, when Professor G. S. Lambert, of the Kansas University Department of Geology, went to Sharon Springs, the depression was a much enlarged irregular ellipse about 125 feet wide and 250 feet long, the longer axis at right angles to the low river bluff which here trends from south to north. Water filled the lower part of the hole, small springs on the river side adding constantly to the water in the pool. The precipitous cliffs on the upland side of the depression were seen to be formed by dark bluish drab stratified rock and on the side toward the river flat of sandy alluvium. At least two thirds of the large hole occupied a part of the former river bluff, the smaller part projecting into the lower ground of the river plain. Evidence pointed clearly to a subsidence caused by solution of rock material under ground, but

the possible extent and causes of this solution were not evident. Sulphurous fumes had been reported by some of the first observers at the hole, but this is very doubtful and there is seemingly no reason to consider seriously a cause other than the subsidence that frequently accompanies removal of soluble rock by underground water.

The writer visited Sharon Springs on April 13 and spent the following few days in observations at the sink and in neighboring parts of western Kansas and eastern Colorado. He found that the depression at Smoky Hill Basin had appreciably enlarged since the time of Mr. Lambert's visit, being fully 150 by 290 feet in diameter at the top. Numerous side cracks, in part roughly concentric to the depression but in part trending for a distance as much as one hundred yards directly away from it to the south indicated that the size of the opening was slowly but steadily being increased. Indeed, there was a readily observable change during the short period of the writer's study.

A systematic series of soundings of the pond revealed a gradual increase in depth of water to about fifty feet, but in an area comprising about one seventh of the bottom the soundings increased very suddenly to 160 or 170 feet. A survey showed that the depression formed by the subsidence has a volume of a little over one and a half million cubic feet. Taking into account the volume which is occupied by the fallen rock débris, which by reason of its fragmentation may be assumed to fill a space at least 20 to 30 per cent. greater than its original volume, the size of the cavity under ground must be large. The depth from the original surface to the top of the material filling the deeper part of the hole is 245 feet; the depth to the bottom of the original cavity may be 500 feet, although this is only an approximate estimate.

The stratified rock exposed in the walls of the depression at Smoky Hill Basin is the basal part of the Pierre shale. The underlying Niobrara chalk which, according to borings in the vicinity, has a thickness of slightly more than seven hundred feet, is only a little below the surface at this place and it crops out in the Smoky Hill valley not far to the east. The chalk is readily soluble, although the large amount of clay in part of the formation impedes the circulation of water. It is not readily possible for water to enter the chalk in this part of western Kansas where the impervious Pierre shale overlies it, but there is a large area in eastern Colorado where the chalk is exposed at the surface or is concealed only by a thin veneer of Tertiary and Recent sand. The elevation of this Colorado area is more than 4,000 feet above sea level, while the top of the chalk east of Sharon Springs is less than 3,300 feet, the stratified rocks being gently inclined from southwest to northeast so that water entering the chalk in Colorado migrates northeastward, dissolving a part of the chalk as it travels. The water is confined to the porous chalk by impervious shale formations above and below it and it is finally released where the chalk reaches the surface at various places in Kansas. Evidence of the solution of the chalk is found not only in subsidence phenomena but in the large amount of calcite which is deposited along fracture or fault planes in the chalk. It is not improbable that the small faults so common in the Niobrara represent settling following removal of material in solution.

The sudden subsidence at Smoky Hill Basin has attracted attention partly because it is fairly large but more because it is very uncommon in the experience of the plains people. Such subsidences are really by no means rare in regions where underground solution is active, but even in limestone regions like Kentucky it is not common for sudden large subsidence to take place under direct observation; rather it is the evidences of past subsidence that are found on every hand.

Western Kansas does not lack evidence that subsidences have taken place in the past; indeed, there are very abundant marks of local sinking. A few miles northwest of Sharon Springs is an excellent example of an old sink, locally known as Old Maid's Pool. This is a nearly circular depression over eighty feet in maximum depth, approximately three eighths of a mile in diameter at the rim and holding at the bottom a permanent small lake about three hundred feet wide. On all sides the rim forms a divide so that topographically the depression is a very striking feature. In relation to geologic structure Old Maid's Pool corresponds closely to Smoky Hill Basin except that a slightly greater thickness of Pierre shale overlies the chalk. Undoubtedly the origin of the two depressions is the same, but the one antedates the other by several scores or perhaps hundreds of years. There are many other, though generally less distinct and accordingly older, depressions of like character. The so-called "buffalo wallows" which dot portions of the plains are small or large subsidence areas resulting from solution, mostly in the Tertiary sediments. There are some very large subsidence areas affecting many square miles in southwestern Kansas.

RAYMOND C. MOORE

LAWRENCE, KANSAS

SCIENTIFIC EVENTS

THE SOLIDIFICATION OF HELIUM

PROFESSOR W. H. KEESOM writes to *Nature* from the University of Leyden on his work on the solidification of helium as follows: