## **American Scientist** Made Many Finds In Rocket Studies

## Dr. Paul H. Goddard Laid Down Rocket **Principles**

The Army has made great strides in its guided missiles program. However, it is indebted to the late Dr. Paul H. Goddard for much of the ground-

Rocketry did not develop simply and gradually. Rather, its principles and theories have been worked on by one group of people, dropped, taken up by another, and sometimes forgotten or

disregarded for generations.

Dr. Goddard laid down principles of rocketry, including the methods of stabilization that are being used today in the Army's "rockets with

Some of his other "firsts" were: 1. Development of the mathemati-

cal theory of rocket propulsion and rocket flight on which all military and experimental calculations now are based. 2. He first proved-both mathematically and by actual test-that a roc-

ket works in a vacuum and needs no air or other substance to push against to obtain its impetus. 3. Development of a rocket motor using liquid fuels. He successfully

used it in 1926, ante-dating its use in the German V-2 by nearly 18 years. 4. He was first to fire a rocket that attained a speed faster than the speed

5. He patented plans for "step" rockets-the firing of a rocket from another rocket already in flight.

6. He developed a gyroscopic steering apparatus for rockets ten years before the Germans developed similar

7. He was first to use vanes in the blast of the rocket motor for steering rockets.

Borrowing from his achievements, the Germans during World War II unleashed the first long-range, rocketpropelled missile-operating at supersonic speed-ever to be used against an enemy. They ably demonstrated that their V-2 rocket could be employed successfully without air superiority. that weather had little or no effect on its performance, and that most counter-measures were ineffective against

When the first V-2 hurtled out of the atmosphere to strike London September 8, 1944, it did not come as a complete surprise. Allied technical intelligence managed to gain information about the V-2 more than a year before it was unleashed by the

The first report, in the autumn of 1943, came from Zurich, Switzerland. It said the Germans had fired rockets that were 45 feet long and weighed 12 tons a distance of 35 to 40 miles. In January, 1944, reports came from Stockholm that a missile similar to this description rose to a height of 35 miles, traveled 65 miles before crashing, and caused a clearing 600 yards in diameter in a forest.

When these missiles would be used by the Germans was a question foremost in the minds of the Allied commanders. This question was answered when the first V-2 struck London in the fall of 1944.

During the remainder of the war, approximately 2,676 V-2 missiles were launched by the Germans. Approximately 1,152 V-2's were thrown against England—517 of them at Lon-

After the capture of Antwerp by the Allies, the Germans hurled 1,341 V-2's against this port-65 per cent landing within a six mile radius of the center of the target.

On May 8, 1945, the war in Europe ended. The launching sites had been over-run and Vengeance Weapon Two had been muzzled-but not for long. Ten months later, the New Mexico desert reverberated to the thunderous roar of another V-2.

His Failing Hubby—Ah, let me back just one more horse dear, and I promise it will be the last. 1





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Mix well in a bowl the beef, rice, milk, onion, 1 teasp. salt and the perper. With wet hands shape meat mixture into 8 balls. Put balls into a skillet about 1/2 inch apart. Mix soup, water and 1/2 teasp. salt until smooth. Save 3/2 cup of the soup mixture. Pour rest of mixture over the meat balls. Bring to a boil, then cover tightly and cook over low heat 45 minutes. Turn meat balls in sauce twice while cooking. Remove meat balls to warm platter. Stir rest of soup mixture into sauce left in skillet. Stir until steaming hot. Serve sauce with the meat balls. Makes 4 servings. NOTE: For best results, use regular or converted rice, but not the quick-cook-ing kind.

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