to subject the arc to the action of a magnetic field in order to produce oscillations. In fact, the oscillations obtained by simply immersing two copper rods in water and starting an arc between them were much more powerful than those produced by a single arc in air, and the stability of the wet arc left nothing to be desired.

This discovery so discouraged Professor Birkeland from pursuing his original line of investigations that the experiments were dropped.

Anders Bull

Chicago, Ill.,
October 25, 1920

ROMANCING IN SCIENCE

To the Editor of Science: "O tempus! O mores!" To one who has used Professor Cajori's book with some confidence, his reply[1] to Dr. Partridge is disturbing. Dr. Partridge concluded[2] that we do not know exactly what experiment Galileo performed from the leaning tower of Pisa. Professor Cajori in reply offers data that (apparently unintentionally) substantiate Dr. Partridge's statement, but he says that it appears to him *too sweeping*.

In Professor Cajori's "History of Physics" (p. 32) the following detailed account occurs:

> The first experiments, which Galileo made while he was a young professor at Pisa, were decidedly dramatic. At that time the doctrine that the rate at which a body falls depends upon its weight was generally accepted as true, merely on the authority of Aristotle. It was even held that the acceleration varies as the weight. Prior to Galileo it did not occur to any one actually to try the experiment. The young professor's tests went contrary to the doctrine held for two thousand years. Allowing for the resistance of the air, he found that all bodies fell at the same rate, and that the distance passed over varied as the square of the time. With all the enthusiasm, courage and imprudence of youth, the experimenter proclaimed that Aristotle, at that time believed by nearly every one to be verbally inspired, was wrong. Galileo met with opposition, but he decided to give his opponents ocular proof. It seems almost as if nature had resorted to an extraordinary freak to furnish Galileo at this critical moment in the history of science, with an unusual convenience for his public demonstration. Yonder tower of Pisa had bent over to facilitate experimentation, from its top, on falling bodies. One morning, before the assembled university, he ascended the leaning tower, and allowed a one pound shot and a one hundred pound shot to fall together. The multitude saw the balls start together, fall together and heard them strike the ground together. Some were convinced, others returned to their rooms, consulted Aristotle, and, distrusting the evidence of their senses, declared continued allegiance to his doctrine.

In his reply to Dr. Partridge, Professor Cajori gives "*the* historical data" and says that from them "it follows that Galileo dropped different weights of a variety of materials and noticed which of them fell faster."

Now, Mr. Editor, from what data does the above quoted thrilling account follow? And from what data and by what processes may other parts of history be reconstructed by scientists? And from what data must it follow in your readers' minds that Dr. Partridge is the scientist guilty of a "declaration" that is "too sweeping"? Recently it cost me many hours of painstaking experimentation to prove that certain improbable statements made in print by a scientist were directly contrary to fact; when the results of the investigation were sent to him, he replied that his had been *merely casual remarks!* Your correspondent happened to see the following in his Montaigne this morning, *Fortis imaginatio generat casum*—there translated, "A strong imagination begetteth chance."

David Wilbur Horn

Bryn Mawr, Pennsylvania

A THRICE TOLD TALE

The conversation which Professor Campbell describes, in a recent number of Science, as taking place at the eyepiece of the Lick telescope in September, 1912, prompts me to quote the closing paragraph of my article on the mercury telescope which appeared in the *Scientific American* for March 27, 1909.

[1] Science, October 29, 1920.

[2] Science, September 17, 1920.

I am tempted, in closing, to tell of the remark made to me by one of the older inhabitants of East Hampton who had paid my laboratory a visit. The milky way happened to be overhead and the mouth of the telescope pit was filled with hundreds of star images. "What are they all anyway?" he asked. "Suns like ours, only bigger," I replied. "You don't say so," he answered, "and have they earths and planets and things going round 'em, and are they all inhabited?" "Very likely," said I, "some people think so." He scratched his head and then turned to me with a restful smile and said, "Well, do you know, I dunno as it makes so *much* difference after all whether Taft or Bryan's elected."

The similarity between the two conversations leads me to believe that Professor Campbell's questioner was leading for an opening to repeat the remark of the old farmer.

Others have been similarly victimized, for in G. Lowes Dickinson's "Appearances" published in 1915, on page 163 a similar conversation occurs between the author and a lone telegraph operator in a railroad shack in the Rockies.

From one newspaper topic to another we passed to the talk about signalling to Mars. Signalling interested the youth; he knew all about that, but he knew nothing about Mars or the stars. These were now shining bright above us, and I told him what I knew of suns and planets, of double stars, of the moons of Jupiter, of nebulæ and the galaxy, and the infinity of space and of worlds. He chewed and meditated, and presently remarked, "Gee! I guess that it doesn't matter two cents after all who gets elected president."

Should it be discovered that the story appears also in the writings of Galileo, or Copernicus, or Pythagoras, it will mean that I too have been victimized.

R. W. WOOD

ARE THE LANCE AND FORT UNION FORMATIONS OF MESOZOIC TIME?

IN a paper recently published by Dr. Stanton we have for the first time a description of the complete fauna of the Cannonball member of the upper Lance formation, consisting of 73 forms; 2 are sharks' teeth, 6 are cup corals (described in an appended paper by T. W. Vaughan), 2 are foraminifers, and the rest are molluscs (31 bivalves, 1 scaphopod, and 31 gastropods). There are 41 new forms, and 2 remain unnamed specifically. Of the 71 invertebrates, but a single bivalve passes upward into the Fort Union freshwater beds (*Corbula mactriformis*), while 24 forms occur below in the marine Fox Hills or older Cretaceous formations. Not one of the species of the entire Cannonball fauna is known in the marine Eocene province of the Gulf of Mexico. In other words, "40 per cent. of the molluscan species in the Cannonball fauna are known in the combined Pierre and Fox Hills or Montana fauna of the same general region, and 30 per cent. of them have been found in the Fox Hills fauna. . . . The fauna clearly belongs to the open sea and was modified after Fox Hills time by the extinction" of the ammonoids and other forms, "and by the introduction of a considerable number of new types that are not known in the Fox Hills and Pierre faunas" (p. 12). This new element, however, is not distinctively Cenozoic, but consists of types that are elsewhere found in the Cretaceous.

Again, the Fox Hills fauna is about of the time of the *Exogyra costata* zone of the Atlantic and Gulf Coastal Plain. The last named fauna has, according to Stephenson, 168 molluscs, and yet not a single one passes upward into any Cenozoic formation. From these and other facts Stanton concludes that "a large element in the Cannonball fauna is directly descended without specific change or with only slight change from the preceding Cretaceous faunas of the Rocky Mountain and Great Plains region. These late Cretaceous faunas show a progressive modernization due to the gradual elimination of distinctive Mesozoic generic types and the concurrent introduction of modern generic types which continued through the Tertiary and are still living in the Recent fauna" (p. 12).

[1] "The Fauna of the Cannonball Marine Member of the Lance Formation," by T. W. Stanton, U. S. Geol. Survey, Prof. Paper 128-*A*, pp. 1–66, Pls. 1–10, 1920.