the spectroscope, thermodynamics and the complex compounds of cobalt.

The one hundred and fifty letters to his friend Ogden Nicholas Rood (1831–1902) reveal Gibbs as a helpful critic and a keen observer of the great developments of European and American science.

When Gibbs planned to leave the Free Academy in New York because of the fatiguing work there, he recommended Rood for the position with this encouragement, "Here is the finest collection of optical apparatus in America" (February 12, 1863). He was deeply interested in plans for spectroscopes and a binocular stereoscope. He followed closely Louis Rutherfurd's work on spectral apparatus, for "the photographs of the electric spark were beautiful and deeply interesting" (February 11, 1862), Gibbs wrote on March 1, 1870, "There is a good chance of getting the Rumford Medal for Mr. Rutherfurd for his improvements in [astral] photography," and made many efforts in that direction. Rood was also deeply interested in this field. Gibbs reminded him on December 8, 1863, of his promise to photograph on silvered glass "to get transparent metallic photographs" because the polished silver surface should be better for stellar photography.

His various estimates of Rood's work are of interest. In 1865 he viewed Rood's results with the photometric spectroscope as opening a new field for investigation. Four years later he wrote:

> Your experiment on the refraction of conducted heat is a most beautiful and important one and must have real value for the theories of heat and sound.

In 1874, he gave encouragement to his work on magnetism; it is "very interesting and important and you must follow it up."

Later, in 1896, another matter was to the front:

> I was much pleased at your remark that the x-rays may after all be only ultra-violet rays about which we really know next to nothing. . . . Your work on the x-rays is very interesting and very valuable.

He considered Rood's paper on the specific heats of iron, copper and aluminum as a valuable contribution to science (May 24, 1898).

Gibbs's comments on his contemporaries are enlightening. Upon discussing Schellbach's paper on the attraction and repulsion of a vibrating body, he commented: "That will clear up the theory of electricity in the end" (June 12, 1870). For him, Zollner's horizontal pendulum possessed "application endless in number" (January 31, 1874). He recognized and appreciated Josiah Willard Gibbs (1839–1903), and did much to turn the Rumford Medal to him in 1880, and hoped that the academy would not lose him, for his published papers in thermodynamics had given him a splendid reputation abroad.

Talk not of the laboratory is amusing. He wrote on October 21, 1872:

> I am much interested in Trowbridge who is one of the best . . . fellows I know. You must see more of him and I know you will like him as he possesses the true scientific spirit. I have never felt much confidence in Draper's work. [Tyndall is] an excellent and attractive popular lecturer and that is all.

He chides Rood:

> You did not do what was right by Remsen! As a true scientific man he had a right to a letter testifying to his real work as an investigator without reference to any special position or to any other candidate. . . . I shall give him a hearty endorsement if he applies to me. . . . I do not know whether Gilman has ever thought of me for the place. But if I go to Baltimore I should like extremely to have Remsen for a colleague. (April 19, 1875.)

A few weeks later he wrote:

> Of course I don't want to leave Harvard for a one-horse college, but I would make many personal sacrifices for better opportunities for scientific work than I have here.

Perhaps in some instances his judgment outside of science would raise some questions. In 1890, talking about university affairs:

> I hear Mr. Low spoken of as a business man only. I am afraid that you are to have a second edition of Eliot who will run the college like a soap factory . . . without any intellectual sympathy whatever.

But there can not be much opposition to his advice to Rood, who was about to visit the Exhibition of 1876 in Philadelphia:

> Don't waste your time on the Woman's Exhibition Building which contains a mighty mass of rubbish. . . . Don't sleep in any of the hotels near the Exhibition, they are poisoned with malaria, and do not forget the quinine.

We may follow his own work. In 1869 he was writing about a new method of making gas analyses; in 1871 he was making a telescope without lenses; in 1874 he admits that he has been anticipated by Fleming in making quantitative determinations by the spectroscope. In 1896 his interests turned to x-rays, radium and the action of an electrified surface. In 1901 he wrote on the discovery of one or two active elements.

> The more I think of the present state of our knowledge about radium, etc., the more it seems to me that we are simply dealing with matter in a greater degree of subdivision, or, more accurately speaking, in smaller atoms than any matter with which we have had to deal hitherto. (April 24, 1901.)