hols represent a class very different from the other liquids, acetone, chlorobenzene and ether. (Nitrobenzene shows a curve similar to that of acetone but much steeper.) Any simple treatment based upon dipole attraction that might apply to the latter group would obviously not apply to the former. Indeed the enthusiasm with which dipole moments have been applied to all such problems should be strongly tempered by a realization of their inadequacy to deal with, first, molecules associated through hydrogen bonds, second, molecules of zero moment but containing vectorially opposed polar groups,[11] and, third, the intermolecular forces to the neglect of van der Waals forces. So far as this last is concerned, London[12] has calculated the magnitude of the components of the potential between molecules of HCl and of HBr. These components are, first, the van der Waals potential due to the "dispersion effect," or interaction of the electron systems, second, the interaction potential of the permanent dipoles, third, the interaction of the moments induced in each by the permanent dipole of the other. The potentials due to the induced moments are nearly negligible compared to the others. By far the largest component is the "dispersion effect." Although the dipole moment of HCl is 1.03×10^{-18} e.s.u., the potential due thereto is only about one fourth of the dispersion potential, and with HBr, with a moment of 0.78×10^{-18}, the dipole potential is only about seven per cent. of the dispersion effect. It should be evident from this that all attempts to deal with the interaction of polar molecules on the basis of their dipole forces alone are doomed to failure.

WOMEN IN SCIENCE[1]

By Dr. FLORENCE R. SABIN

THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

President Park: I can not express adequately to you and to your committee the pleasure I feel in receiving this prize, for there is distinction to an honor which bears the name of M. Carey Thomas.

I confess at once that any award for work in science must awake a certain sense of timidity; for one can never be sure that research will stand. How often have the supposed facts and theories of the very ablest been reversed by new evidence! In the case of my own work, I can see with great clarity how far it is from reaching its goal.

But why does an honor from Bryn Mawr touch so deep a sense of gratification? It is because of the traditions of this place and all that they have meant for scholarship and for women. I remember so vividly getting the essential quality of this spirit on the occasion, now thirteen years ago, when Miss Thomas retired from the presidency of the college. There was not a person who spoke at that time, former members of the faculty and former students alike, who did not bring out that the influence of Miss Thomas had been in a quite unique manner toward fostering high standards of work. This is what she has bequeathed to the college. What a gratification it must be to her, President Park, that you have the same feeling for scholarship and that you have carried on and extended the high traditions of Bryn Mawr.

It seems to me fitting that I should speak of certain points concerning the influence of Miss Thomas on education in science. As is well known, the greatest function of the president of any institution of learning is the choosing of a faculty. Moreover, real ability for this function consists in having the insight to select scholars while they are still young, before they have demonstrated their full power. To use only one example, but that one striking enough, the early faculty of Bryn Mawr College included three young men who became our most distinguished biologists. Edmund B. Wilson, Thomas Hunt Morgan and Jacques Loeb have given American biology world-preeminence. It was, I think, Professor Wilson who first won from Europe full recognition for American biological research. In 1911 he was invited by the editor of the *Archiv für mikroskopische Anatomie* to republish in a foreign journal his work on the X-chromosome in relation to sex. It is interesting to recall that in this article he gave full credit to the work of Netty Stevens, who had independently and at the same time made the same discovery. As you well know, Miss Stevens did her work here and she had here a research position with almost no obligations for teaching, such as is seldom held in our universities except by the professor emeritus. Such a group of scientists as was and is still assembled here depends, of course, on the presence of the graduate school which was established at Bryn Mawr from the start along with the undergraduate department.

I want next to dwell on the influence which Miss Thomas exerted on medical education. The opening of the Johns Hopkins Medical School in 1893 was made possible by a fund raised by a group of women

[11] J. H. Hildebrand and J. M. Carter, *Proc. Nat. Acad. Sci.*, 16: 285, 1930.

[12] F. London, *Z. Physik*, 63: 245, 1930.

[1] Response on receiving the M. Carey Thomas Prize on the occasion of the fiftieth anniversary of the founding of Bryn Mawr College.

led by Miss Thomas and Miss Mary E. Garrett, of Baltimore. The money for this fund was in the main contributed by Miss Garrett, but far more important than the actual gift of money, which determined the time of opening the new medical school, were the conditions under which the fund was given and accepted. I think that Miss Garrett would be especially pleased to have us here recognize the rôle which Miss Thomas played in this event. She laid down the conditions which were to be met, namely, a college degree or its equivalent, a knowledge of physics, chemistry and biology, proficiency in foreign languages and the admission of women on the same terms as men.

These events have not yet been adequately described, and it is to be hoped that Miss Thomas will deal with the subject in her autobiography. As new historical data, I present the following: During the last year of his life, Dr. William H. Welch told me that the conditions proposed by Miss Thomas had been discussed; that indeed he himself had outlined them in a public address without, however, any faith in the possibility of their adoption. These are great events in the history of the medical profession of which we are speaking. Certain it was that the adoption of these requirements for admission to the new medical school in Baltimore lifted the standards of the whole medical profession in this country and made medicine a graduate subject. Within a short time all the good schools raised their standards of admission and the poorest schools were closed. To make the meaning of this point clear, a short time ago I asked the dean of one of our best law schools why the legal profession had been so slow in reforming itself, in the light of new knowledge, and he replied that the main reason was that the legal profession had not yet taken the step made by the medical profession forty years ago, of establishing high requirements for admission to the study of law, so that still the poorest of law schools flourish side by side with the best.

Enough has been said to show that Miss Thomas had a profound influence on medical education. In her attitude of no compromise of standards, even when they were deemed utterly impracticable, I fancy that she had two things in mind, first, an intense belief in the value of higher education, and second, a determination that if she were to help women into professional work, it should be only for work of the highest standard. The admission of women into the Johns Hopkins Medical School on the same terms as men has opened up to women every opportunity for advanced work in medicine which they have since had. From this it is clear how great is my own personal obligation to Miss Thomas.

May I now say a word about women in science? Since we are still told that women are an inferior group in the affairs of the mind, I propose to ask the question, What new data on this subject have the past fifty years brought forth? It is important to discuss this matter dispassionately and quite without emotion —as I, for one, perhaps could not have done forty years ago. Forty years of study in science have convinced me that the book of human progress has not been closed and the possibilities of development are not yet defined. We admit at once that no great volume of scientific work has yet been done by women. But is there any work by women, judged rigidly "by the same standards as for men," which is of such high quality that it marks a milestone in scientific progress? If we can say yes, then we shall argue that nature is not so prodigal of that grade of ability as to make it wise to waste any of it.

In answer to this question, I wish to bring to your attention the work of three women, all of them European, whose work in science has this common characteristic, that it has opened up whole new fields of knowledge.

I shall not linger to prove the point about Madame Curie, for her share in opening up the subject of radio-activity and its significance in revealing the structure of matter are too well established to need emphasis.

My second name is less well known. A little more than fifty years ago, there was a young girl of nineteen in a small town of north Germany, with a strong bent for research, but when her brother went to the University of Göttingen she, according to the customs of her country, remained at home. Agnes Pockels had observed the streaming of currents when salts were put into solution and, by attaching a float to a balance, had found that salts increased the pull of the surface of the fluid. In other words, she had discovered surface tension. This was in 1881. She did not know whether any one else had ever observed this phenomenon, but, through her brother, she brought her work to the attention of the professor of physics at Göttingen. It was, however, new and he failed to grasp its significance. For ten years she went on studying the properties of solutions quite alone in her own home. Then the renowned English physicist, Lord Rayleigh, began to publish on this subject, and so she wrote to him about her work. With a fine sense of honor, he sent a translation of her letter to the English journal, Nature,[2] asking that it be published. He wrote that the first part of her letter covered nearly the same ground as his own recent work and that with very "homely appliances" she had arrived at valuable results respecting the behavior of contaminated water surfaces. It is interesting to note that it is this same "homely device" that is still used to measure surface

[2] *Nature*, 43: 437, 1891.

tension. Lord Rayleigh then added that the latter part of her letter seemed to him very suggestive, raising, if it did not fully answer, many important questions. Then for a few years he arranged for the publication of all her work in English, until the Germany of another era (1898) was proud to accept her discoveries for publication in her own language.[3]

When we state that the significance of the subject of surface tension lies in the fact that salts in solution arrange themselves in a monomolecular layer at the surface, and that the relation of every cell in the body to its surrounding medium depends upon this arrangement, we shall not have to stress further the importance of surface tension or its discovery. Agnes Pockels was one of the founders of our knowledge of this branch of physical chemistry, and none can read her letter to Lord Rayleigh and question her originality. She is now over seventy and I like to think that as she reflects on the new restrictions on the mental life of women in her country, she must know that no edict of government can subtract the fine product of her thought from the assets of mankind.

Here in Bryn Mawr College you will know the third example before she is mentioned. Emmy Noether is admitted by her peers into that small group of the world's greatest mathematicians. She was one of that brilliant group of mathematicians at Göttingen whom fate has scattered into many lands. Her field was algebra. Professor Einstein has said of her that she discovered methods which have proved of enormous importance in the development of the present-day younger generation of mathematicians; and Professor Weyl, that she originated a new and epoch-making style of thinking in algebra and, perhaps most significant of all in speaking of a woman, that her strength lay in her ability to operate abstractly with concepts. One can not read the account of her work, given by Weyl at the Memorial Service to her here at Bryn Mawr last spring, without realizing the great beauty of her power of thought. Nature endowed her with that creative insight which is only to be described by the strongest word in our language, "genius."

She was one of the great minds of our time and, when this is fully realized, then the turn of fortune, sinister and weighted with ill-will, that lost her a chance to work in her own country, yet brought her here, will be seen to have its bright side. What a happy event that Miss Thomas, with her passionate belief in women, knows that the one woman of our generation to whom the name "genius" can be applied unequivocally "on the same terms as men," should have been added to the faculty of Bryn Mawr College!

And now, President Park, Einstein has said that the last eighteen months of Emmy Noether's life, spent as they were on your faculty, were the happiest and the most fruitful of her career. Surely these words are your enduring reward. And it is clear enough that your influence has not been limited to the walls of Bryn Mawr College. All women everywhere who care for the things of the mind are in your debt. I feel especially happy that this occasion gives me the chance to be spokesman of our gratitude. Our d is not only because throughout your administrat you have held up the high traditions of this colle but far more because during a period of history wh powerful forces, to use a significant medical ter seek to sensitize the mind of the whole world to prej dice, you have shown that you place intellect first.

[3] An account of her life and her bibliography are given in *Kolloid-Zeitschrift*, 58: 1, 1932.

SCIENTIFIC EVENTS

THE BIOCHEMICAL RESEARCH FOUNDATION OF THE FRANKLIN INSTITUTE

THE Biochemical Research Foundation of the Franklin Institute has been formed in Philadelphia by the separation of the Cancer Research Laboratories from the University of Pennsylvania. The new foundation will have for its aims: (1) the study of disease from a chemical point of view, (2) the study of new organic compounds for their therapeutic, medicinal and curative values and (3) the study of longevity and the diseases of age with the hope of prolonging the span of life.

The new foundation, which will be a sister institution to the Bartol Research Foundation for Physics, is under the director, Dr. Ellice McDonald, and consists of forty-three workers occupying forty-seven rooms and is divided into three departments: The Department of Chemistry, Dr. E. F. Schroeder, chief; The Department of Physics, Dr. A. J. Allen, chief, and The Department of Cytology, Dr. J. O. Ely, chief. There will eventually be added departments of pharmacological research, of synthetic and organic chemistry and of therapeutics.

The new Biochemical Research Foundation will remain for the present in its former quarters, 133 South Thirty-sixth Street, Philadelphia. It maintains in addition two outside laboratories. A volume recording the work of the past year, comprising thirty-three scientific papers, will be issued in January.

AWARDS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

THE eighty-third meeting of the American Society of Civil Engineers will be held in the Engineering