shoes, Mr. Harlan I. Smith is having desert shrubs set out and is selecting other shrubs to be set in between these. Then clover and grass will be planted, which being sheltered can grow where the tourists pass. This clover and grass will be feed for the Indians' cattle and they will crop it close, thus saving the expense of a lawn-mower. The trees along the path, the shrubs and wild flowers to be scattered among them will make the Kitwanga Garden of Native Plants of great interest to tourists. There are now many individual specimens of over twenty-four species on the tourists path and part of these are already labeled. Mr. Smith would be glad to receive labels or books from which labels may be cut to weatherproof, mount and frame for use until labels embodying the native Indian uses may be printed. Such names with description as are found in Reed's Wild Flowers serve fairly well, and as weatherproofed by Mr. Smith will last through rain and snow for from two to five years.

A DAM costing $100,000 is being constructed by the Engineering Foundation Committee on Arch Dams. The dam is later to be destroyed in studying various questions of dam construction. Dr. Charles David Marx, professor emeritus of civil engineering at Leland Stanford Junior University, has been elected chairman of the committee to carry on the work. The dam is being built on Stevenson Creek, a tributary of the San Joaquin River, about sixty miles east of Fresno, Cal. Engineers in many countries are cooperating, W. A. Slater, of the U. S. Bureau of Standards, has taken charge of tests at the dam. Many small models will be built and tested as the work on the large dam proceeds.

UNIVERSITY AND EDUCATIONAL NOTES

COLUMBIA UNIVERSITY is the beneficiary in the will of Mrs. Annie C. Kane of two gifts of $500,000, one to be devoted to religious instruction, the other unconditional, to be used for whatever purpose the trustees may see fit. Mrs. Kane also left $1,000,000 to the New York City Home for Incurables on condition that part be used for a building where incurable cases of cancer shall be treated.

A BEQUEST amounting to nearly £100,000, which is to be divided between the University College of Wales, Aberystwyth and the National Library of Wales, is made in the will of the late Sir John Williams, of Blaenllynant, Aberystwyth. In addition, gifts of £1,550 and of pictures, books and MSS. are made to the latter of these institutions.

DR. F. W. OWENS, for nineteen years a member of the faculty of Cornell University, has accepted an invitation to become head of the department of mathematics in the School of Liberal Arts at the Pennsylvania State College. He will begin his work with the opening of college this month, succeeding the late Professor Joseph Moody Willard, who died in 1923.

ALFRED W. GAUGER, Ph.D. (Princeton), has been appointed to take charge of the work of the Engineering and Mining Experiment Station of the University of North Dakota.

DR. E. L. REED has resigned his position as professor of biology at John Tarleton Agricultural College at Stephenville, Texas, to accept a professorship of botany at the Texas Technological College at Lubbock.

FELLOWS in medicine of the National Research Council have accepted positions as follows: David L. Drabkin, M.D., for two years fellow in biochemistry at Yale University, has been appointed to an instructorship in the department of biochemistry in the University of Pennsylvania, and C. H. Thienes, M.D., for one year a fellow at Stanford University Medical School, is now assistant professor of pharmacology in the University of Oregon Medical School.

DR. W. ROBINSON, senior lecturer in the department of cryptogamic botany in the University of Manchester, has been appointed to the chair in botany in University College, Aberystwyth, in succession to Professor Lloyd Williams, who retires under the age limit in September.

DISCUSSION

RADIATING POTENTIALS OF THE BAND SYSTEMS OF CARBON MONOXIDE

WHEREAS an atom can absorb energy only by a change in the configuration of its electrons, a molecule can absorb energy by changes in the configuration of the nuclei of its constituent atoms and by changes in its speed of rotation as well as by changes in the arrangement of its electrons. When a molecule absorbs energy by one or more of these processes, it is said to be in an excited state. Transitions between its possible states give rise to the absorption or emission of its spectrum. Coupled with each electronic transition there may be several vibrational (nuclear) transitions, and coupled with each vibrational transition there may be a number of rotational transitions. On account of these coupled transitions molecular spectra are characterized by associated band groups constituting band systems.

The bands of a system are all due to the same electronic transition, and so an entire system in molecular spectra replaces a single line in atomic spectra. The energy, in equivalent volts, necessary to change a molecule from its normal state to one of its excited

states is the excitation potential of that state and the radiating potential of all spectral lines which require this as the initial state of the molecule. We shall define the radiating potential of a band system as the excitation potential of the zero vibrational and zero rotational level of the initial state.

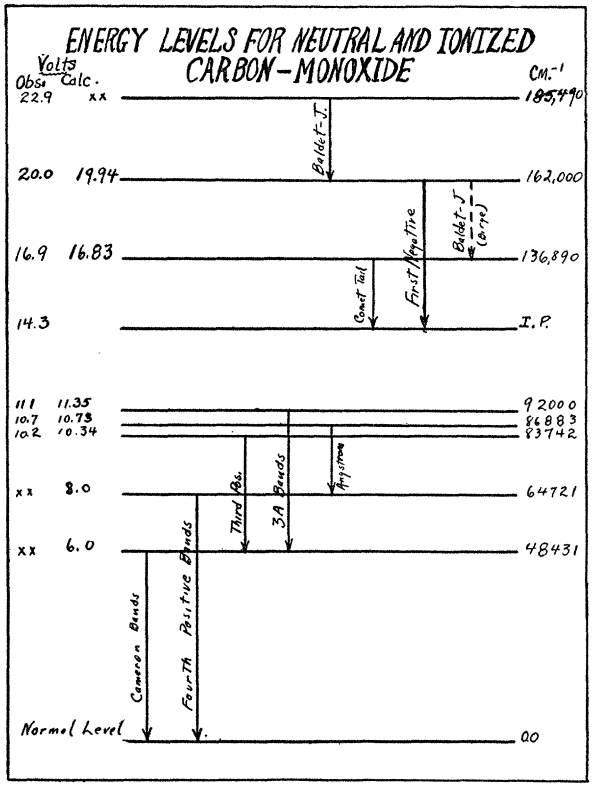

FIG. 1

The radiating potentials of the band systems of the neutral and ionized carbon monoxide molecule, except the Fourth Positive and Cameron bands, were determined by a photographic method, the spectra being excited by electron impacts. The spectra were analyzed on the basis of the quantum theory of band spectra and the relationships between the several systems were determined from these analyses. These relationships have been determined in a similar manner for a part of the bands by Birge[1] and for another part by Johnson.[2] After these relationships have been determined, it is possible to calculate the radiating potentials of the systems. The accompanying diagram indicates these relationships and gives the observed and the computed values of the radiating potentials of the several systems. It will be noticed that the observed radiating potentials confirm the system relationships deduced from the analyses in all cases except that of the Baldet-Johnson system. This system contains so few bands that its relation to others can not be determined with certainty by analysis.

From the results of our investigation it seems that several bands usually included in the Ångstrom system were due to impurities in the gas employed by the original investigators. They fail to appear on any of our spectrograms and, furthermore, do not fit into the term scheme of this system. On the other hand, two bands not previously reported with edges at λ3680.5 and 3894.3 seem to belong to this system. Further work is in progress on the measurement and analysis of the Ångstrom bands.

In a letter to *Nature* (Vol. 118, 12, 1926), the writers described an experiment which demonstrated that the Third Positive carbon bands belong to CO and really comprise two systems which we called the Third Positive and 3A systems. During the course of that experiment new bands were discovered in the spectrum of the flowing gas. They extend from about λ3000 to 5000A. It was concluded from their manner of excitation that they belong to CO_2. An investigation of these bands is now in progress in this laboratory. It was found that some of the strongest of these bands appear in the spectrum of the low voltage arc in CO in the region of the Ångstrom system. It requires strong excitation at pressures of the order of 2 mm to bring them out. Their presence in the arc in CO is accounted for by the dissociation of CO and the subsequent formation of CO_2 during the passage of the discharge.

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[1] *Nature*, 117, 230, 1926.

[2] *Nature*, 117, 376, 1926.

THE RELATION OF NITRATES TO TOBACCO FRENCHING[1]

TOBACCO frenching is a disease in which the new leaves are chlorotic, especially between the veins. The leaves may be normal in shape but in severe cases are narrow and ribbonlike. They finally develop normal color. Although little is known in regard to the disease, it is generally believed to result from adverse soil conditions, especially poor drainage.

The past winter Turkish tobacco plants, growing in highly organic soil from a forest on the Kentucky Experiment Station farm, frenched, thus giving an opportunity for a study of the disease in pots in the greenhouse. A total of over two hundred frenched plants have been produced in soil and sand cultures. As quite definite results have been obtained both in producing the disease and in controlling it under greenhouse conditions, a short statement of the results obtained will be given.

[1] Published by permission of the Director of the Kentucky Agricultural Experiment Station.