eral quawks were fascinated by the lantern, and we pushed up close to them before they started off with owl-like motion and discordant cries.

The writer is now able, from personal studies, to report 163 species of fishes in waters extending from Gravesend Bay eastward to Mecox Bay, and refers to his articles published in the Nineteenth Annual Report of the New York Fish Commission (1890) and the Bulletin for 1897 of the American Museum of Natural History, New York City.

The marine fishes now certainly known in the New York fauna represent 200 species. The fresh waters contain 116 species, and there are, besides, 13 anadromous forms. The list might be further increased by the addition of the following fishes concerning whose pertinence to the fauna there is more or less doubt: *Lucius vermiculatus*, *Seriola lalandi*, *Coryphæna equisetis*, *Boleosoma nigrum*, *Polyprion americanus*, *Epinephelus niveatus*, *Dules auriga*, *Zenopsis ocellatus*, *Spheroides trichocephalus*, *Aspidophoroides monopterygius*, *Ulvaria subbifurcata*, *Stichæus punctatus*, *Leptoblennius serpentinus*, *Cryptacanthodes maculatus*, *Anarhichas lupus*, *Trigla cuculus*, *Brosmius brosme*, *Hippoglossoides platessoides*, *Ogcocephalus vespertilio*.*

Thus, a catalogue of the New York fishes, based upon our present knowledge and including the foregoing 19 forms doubtfully assigned to the fauna, will contain 348 species. It should be remembered that no systematic account of the fishes has been published since 1842, and many large regions of the State are almost, or altogether, unknown to the ichthyologist.

TARLETON H. BEAN.

*The bat-fish must be transferred to the list of species known to occur in New York. Dr. Theodore Gill, in the mid-summer of 1854 or 1855, saw a recently-caught example of it at a wharf at the foot of 27th Street, East River, New York. No record of its occurrence was published.

SUPPRESSION OF SMOKE.

THE devising of practicable methods of reduction of the 'smoke nuisance' has become one of the most important problems in applied science for our time, and has been a subject of experiment and of legislation for many years past. Of late, some success has been met with on both sides the Atlantic. In St. Louis, perhaps, as great success has been attained as in any city in the United States, through the public-spirited cooperation of the city government, the Board of Trade and the scientific men and leading engineers of the place; but there remains much to be done and investigations are still in progress, some of which are important. Recent discussions at Philadelphia, under the auspices of the Franklin Institute,* have thrown much light upon the subject and have afforded many valuable facts and data.

We have now the published results of another and formal investigation by a commission, organized at Paris, composed of MM. Huet, Brull, Hirsch, Humblot, Lamouroux, Michel-Levy and DeTavernier, all holding important positions in the municipal administration, or in the great schools of mines and engineering, or as leading members of the Society of Civil Engineers. The commission was in session, at intervals, from June, 1894, to October, 1897. It made a study of reports and documents bearing upon the subject, conducted important experiments, reduced them to order and studied out definite conclusions, and also investigated the origin, state and the progress of the art, completing its report at the last-named date. This document of over 150 pages, large 8vo, with 25 plates, is now in process of distribution.†

Although more or less attention had been

*Journal Franklin Institute, June, 1897.

†"Concours pour la suppression des fumées produites par les foyers de chaudières à vapeur. Rapport de la Commission technique. Prefecture du Depart-

given the subject by the municipal government for years, nothing had been accomplished, and it was, in this instance, proposed to organize a technical commission to conduct competitive tests of various methods and apparatus having for their object the suppression of smoke from boiler-furnaces. The above-named commission was accordingly formed and was assigned a credit of 8,050 francs for expenses. The commission was to select acceptable forms of furnace and report to the city government for their license and use. One hundred and ten competitors appeared, their schemes including the following:

GENERAL PLAN OF PROCEDURE.

(1) Mechanical feed and methodical combustion.	16
(2) Supplementary injection of air, hot or cold..	20
(3) Injection of steam, with or without air.....	5
(4) Stirring the gases.....	7
(5) Gas producers and heating the gases.....	7
(6) Combustion of dust fuel...	2
(7) Washing the smoke	16
(8) Various other systems.....	37
	110

Of the total, three-fourths were French devices, one-fifth English, 3 American, and the others of various European nationalities. A preliminary study led to the careful test of ten. These were tested to ascertain whether they were capable of burning ordinary fuels without smoke and whether they were suitable for use in steam-making.

They were tested with rapid and with slow combustion, with operatives supplied by the makers and with firemen furnished by the commission, under the direction of first the one and then the other. The intensity of the smoke was observed and noted on a scale of five points. The usual standard methods of determining the efficiency of the apparatus were employed. The corps of observation was detailed from the offices of the city administration, organized and directed by the commission.

The history of legislation, as given, traces the progress of the subject in England from the time of Charles II., who, two hundred years ago, inaugurated repressive measures. In France this form of legislation began with an imperial decree in 1810. Both countries now have well-considered laws for suppression of smoke in cities. The technical history, curiously enough, begins with plans by Denis Papin. The next inventor to follow this illustrious man of science was James Watt, with his inverted draught and later arrangement of 'dead-plate.' The 'automatic stokers,' '*très usités en Amérique*,' are referred to and their incidental but none the less effective, smoke reductions are described. Legislation now exists in all civilized countries, and many more or less effective devices and methods are in use for suppression of smoke.

A commission of distinguished engineers and scientific men was organized by the German government, in 1892, which, after prolonged experimental investigation, concluded that success had not been attained, but that the way to success was clearly indicated. This commission, in computing the heating power of combustibles from analyses, adopted the formula: $8000\ C + 29000\ (H - O/8) + 2500\ S - 600\ W$; where W is moisture.

The outcome of the work of the French Commission was the refusal to assign a first prize, the awarding of two second prizes, of two first mentions and of one second mention. The conclusions formulated indicate that the Commission is not satisfied that a real success has been achieved, but nevertheless the researches were not without value. Like the German Commission of 1892–4, it is concluded that "The work of the Commission should be considered only as a contribution to the study of 'fumivorité,' and it is to be hoped that these re-

ment de la Seine, Ville de Paris, République Française—Liberté, Égalité, Fraternité." n. d.

searches may continue. There remains much to be done and a part of this collection of exhibits has very nearly attained the object proposed."

Among the specific conclusions are these:

Smoke cannot be suppressed without considerable excess of cost.

Special fuels, as anthracite, coke, fuel-gas and mineral oils, may be resorted to, and with success, where cost is not objectionable.

The chimney-top should be visible to the man at the furnace.

Prolonged trials should supplement such investigations as those prosecuted by this Commission, to ascertain the durability of the apparatus and of its efficiency.

Existing legislation, well enforced, is advised, rather than any specific new legislation.

The appendix to the report is an elaborate presentation of the logs, tables and drawings of the apparatus of the trials described in the text. The whole constitutes a very valuable contribution to the literature of the subject, in the department of applied science, and deserves to be permanently preserved in every library of applied science, beside the reports of the Franklin Institute discussion.

R. H. THURSTON.

AMERICAN MATHEMATICAL SOCIETY.

THE fifth annual meeting of the American Mathematical Society was held in Fayerweather Hall of Columbia University, on Wednesday, December 28, 1898. On the two following days the Chicago Section of the Society held its fourth regular meeting in the Ryerson Physical Labratory of the University of Chicago. At the election held at the annual meeting the following officers and members of the Council were chosen: President, R. S. Woodward; First Vice-President, E. H. Moore; Second Vice-President, T. S. Fiske; Secretary, F. N. Cole; Treasurer, Harold Jacoby; Librarian, Pomeroy Ladue; Committee of Publication, T. S. Fiske, F. N. Cole, Alexander Ziwet; members of the Council to serve for three years, Maxime Bôcher, James Pierpont, Charlotte Angas Scott.

The Society has now completed its tenth year of continuous existence, having been organized as the New York Mathematical Society in November, 1888, and reorganized under its present title in July, 1894. The *Bulletin* is now in its eighth annual volume; the first number appeared in October, 1891. The present membership of the Society is 315. About ninety papers have been presented at its meetings during the past year. The Chicago Section was organized in April, 1897, and has proved from the beginning a valued addition to the Society's strength.

At the annual meeting the following papers were read:

(1) PROFESSOR M. I. PUPIN: 'On multiple resonance.'

(2) DR. A. S. CHESSIN: 'On the development of the perturbative function in terms of the eccentric anomalies.'

(3) DR. A. S. CHESSIN: 'On some points of the theory of functions.'

(4) PROFESSOR E. O. LOVETT: 'On the transformation of straight lines into spheres.'

(5) DR. E. J. WILCZYNSKI: 'A generalization of Appell's factorial functions.'

(6) PROFESSOR ORMOND STONE: 'On the solution of Delaunay's canonical system of equations.'

(7) DR. VIRGIL SNYDER: 'Asymptotic lines on ruled surfaces having two rectilinear generators.'

(8) DR. G. A. MILLER: 'On a memoir on the substitution groups whose degree is less than nine.'

(9) DR. W. SCHULZ: 'On the partial differential equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = ke^u$$

and its connection with Dirichlet's principle.'

The following is a list of the papers read before the Chicago Section:

(1) DR. L. E. DICKSON: 'The determination of the structure of all linear homogeneous groups in a Galois field which possess a quadratic invariant, with the announcement of two new systems of simple groups.'

(2) MR. CARL C. ENGBERG: 'The Cartesian oval and the auxiliary parabola.'