TENTH INTERNATIONAL CONGRESS OF MATHEMATICIANS*

THE First International Congress of Mathematicians was held in Chicago 71 years ago and 25 mathematicians attended it. The Tenth Congress held at Amsterdam was attended by more than 2,000 ordinary and associate members. Forty-five countries including Russia participated in it; no Chinese delegate attended. The Congress represented a beautiful cross-section of the whole mathematical world, and showed how unity of purpose at a scientific level could get rid of all differences in caste, creed, colour and politics. Nineteen Indians registered themselves for the Congress, but only twelve attended. A number of them were already on the continent attending post-graduate courses. Prof. K. Chandrasekharan of the Tata Institute of Fundamental Research, Bombay, and Prof. B. R. Seth of the Indian Institute of Technology, Kharagpur, attended it as delegates of the Government of India.

In his Presidential Address, Prof. Shouten pointed out that there was hardly an activity in modern society which did not require the help of mathematics. A great responsibility had therefore come to rest on the shoulders of the mathematician. In the last two decades mathematics had played a great part in all technological advances and a large number of social and economic developments. In fact, as sciences grew to perfection they became mathematical. Thus had arisen the need for a large number of trained mathematicians in every branch of the subject.

In the afternoon Prof. J. von Neumann gave an address "On Some Unsolved Problems in Mathematics", a topic dealt with in a similar Congress by Hilbert in 1900 He discussed some problems of linear operation theory in non-compact spaces and ended with the suggestion that the logistic and probabilistic viewpoints may be brought together by developing them from the same set of axioms.

From September 3 to September 9, the Congress split itself into many sections and subsections, sometimes as many as twelve working simultaneously. The following represents a cross-section of what was actually presented at the meetings.

E. C. Titchmarsh gave an account of the work done on eigenfunction problems arising from differential equations of the type $\Delta^2\phi + [\lambda + f(x, y)]\phi = 0$. These problems arise out of Schrodinger's wave equation and have been extensively given by him in current journals. The classical method of residues is used and no general theory is employed.

Harishchandra gave an account of the work done of representation of semi-simple Lie groups. E. Stiefel showed how second order scalar procedure may be adopted in relaxation methods. He gave an account of the first order iteration method and discussed in detail the gradient method for error measure at each stage. Taking the linear equation in the matrix form $Ax = k$ and assuming that A is symmetric and positive-definite he showed how the error measure may be determined at each state —a problem which has become important in view of the widespread use of relaxation methods. As a particular case he discussed the hypergeometric relaxation.

M. Reiner described the work of B. R. Seth on second order effects in elasticity. P. G. Bardoni derived some properties of finite strain invariants. A. Weinstein gave an account of axially elliptic and hyprobolic problems in which he and his co-workers have done much lot of work.

B. R Seth read the papers of his co-workers S. D Nigam and G. Bandyopadhyay on axis-symmetric and plane compressible flows. In Nigam's paper exact rotational solutions are obtained by transforming the equations such that the solution is made to depend on the linear equation $(D^2 + k^2)\,\Psi = 0$, D^2 being the Stokesian stream function operator. The solutions for spheroids are obtained in terms of wave cylinder functions and to the existing two boundary conditions another condition of no slip on the boundary is added to obtain the three arbitrary constants. In G. Bandyopadhyay's paper, conditions are investigated for deriving solutions of one-dimensional gas flows through an elastic tube from those for a corresponding rigid tube. The central assumption that the pressure is a function of the cross-section was open to criticism.

In another paper on "Synthetic Method for Compressible Flows", B. R. Seth indicated how the method, which has been used in a number of problems by his co-workers, H. G. Venkatesh, M. K. Jain and J. R. Foote in America, can be employed to investigate compressible

* Held at Amsterdam, Sept. 1 to Sept. 9, 1954.

flow problems. The equations of continuity is reduced to the canonical form

$$\nabla^2\phi_1/\phi_1=\nabla^2\rho_1/\rho_1,\ \phi_1=\rho^{\frac{1}{2}}\phi,\ \rho_1=\rho^{\frac{1}{2}}$$

and it is shown how some problems of uniform compressible flow may be solved. The possibility of using the method for discussing the formation of shocks was indicated.

J. J. Stoker showed how a perburtation technique for non-linear problems applied to shallow water waves gave a number of interesting results including that of the solitary wave.

B. Jessen of Denmark gave some results of the theory of almost periodic functions He gave an account of Bohr's work and made out that any trigonometric polynominal of the form $\Sigma a_n e^{i\lambda_n t}$ possessed a mean motion. D. Gilbarg discussed methods in fluid dynamics with special reference to compressible flow. V. G. Szebehely showed that the classical formulation of the motion of a solid through an incompressible liquid was not suitable for free surface and impact problems. Starting with Bernoulli's equation he showed how a set of integral transformations gave the necessary results A. R Mitchell gave elementary solutions of shear flow through circular, elliptic and parabolic cylinders.

D. Van Danstzig gave an account of the mathematical problems raised by the floods of 1953, which affected about one-third of Holland. They were of three types—hydrodynamical, statistical and economictrical. Of these the last two were found to be of an elementary type. The hydrodynamical problems presented some interesting features The area affected was idealized into an infinite medium of uniform depth internally bounded by a rectangle with three sides fixed The reduced equations of motion were solved with the help of Laplace's transform

K. Chandrashekharan spoke on localization and uniqueness theorems in Fourier analysis of more than one variable. He showed that results obtained by analogy from one to higher dimensions need not always be correct. Thus arose the need of closely examining all extensions of one-dimensional Fourier series results to multi-dimensional analysis which is used in eigenfunction expansions of solutions of the wave equation. He pointed out a number of unsolved problems.

M. L. Cartwright dealt with non-linear vibrational equations of the type

$$\ddot{x}-k(1+\alpha x-x^2)\dot{x}+x=pk\cos lt$$

where k is small and α may be small or great. If α is small it is found that the results are unaffected, otherwise there is a marked difference.

S. Goldstein spoke on some methods of approximation in fluid dynamics. He pointed out that for higher approximations we should consider the fluid as a whole and not simply the boundary layer. He discussed the case of parabolic cylinder in detail and doubted if the irrotational and the boundary layer solutions could be patched together to give one solution. In this connection mention may be made of the synthetic method for flow problems which gives a continuous pattern for the whole fluid, including the boundary layer. This is being developed at the Indian Institute of Technology by B R. Seth and his co-workers.

A large number of other papers on algebra, theory of numbers, analysis, geometry and topology, probability and statistics, mathematical physics and applied mathematics, logic and foundations, philosophy, history and educations were also read

On the closing day, September 9, A. N. Kolmogorov of Russia spoke on general theories of dynamical systems and classical mechanics. The Congress ended after deciding that the Eleventh Congress of Mathematicians be held in 1958 in Edinburgh in the month of August.

B. R. SETH.

RECESSION OF STARS

REPORTING on studies made on the recession of stars over the past 20 years, Dr Allan R. Sandage, of the Mount Wilson and Mount Palomar Obsevatories, observes that the observations made by himself, Dr M L. Humason, of Mount Wilson and Mount Palomar, and Dr. N. N Mayall, of the Lick Observatory of the University of California have gone as far as the Hydra Cluster, roughly 333 million parsecs. The speed of the recession is 180 kilometres for each million parsecs, a parsec being 3·3 light years.

The Hydra Cluster was found to be receding from the earth at one-fifth the speed of light. This system is the farthest in space so far measured, but there is hope that existing equipment will make it possible to extend the measurements to objects receding at one-third the speed of light, or distances of 550 million parsecs.