271. Stefan Bergman: *Operators in the theory of partial differential equations and their application.* II.

Let $v(x, y)e^{i\theta(x,y)}$ denote the velocity vector of an irrotational steady flow of compressible fluid. Let $\zeta=\Lambda(v)+i\theta$, $\bar{\zeta}=\Lambda(v)-i\theta$, where $d\Lambda(v)/dv=[1-M^2]^{1/2}/v$, and $M=v/[d_0^2-(1/2)(k-1)v^2]^{1/2}$, $d_0$ and $k$ being constants. Finally: let $E^*=1+t\zeta^{1/2}Q(\zeta, \bar{\zeta}, t\zeta^{1/2})$ where $Q(\zeta, \bar{\zeta}, p)$ is an (arbitrary) solution of $Q_{p\bar{\zeta}}+2p(Q_{\zeta\bar{\zeta}}+FQ)+2F=0$, and $Q$ is supposed to be an odd function of $p$. Then $\psi(v, \theta)=Re\{\int_{-1}^{1}T(\zeta+\bar{\zeta})E^*(\zeta, \bar{\zeta}, t)f[(1/2)\zeta(1-t^2)]dt/(1-t^2)^{1/2}\}$ where $f$ is an arbitrary analytic function of one complex variable is the stream function of a suitable subsonic flow, and the stream function of every flow can be represented in the above form. $T$ and $F$ are suitable functions of $(\zeta+\bar{\zeta})$. Using this result the author proves that various sets of particular solutions $\{p_\nu(v, \theta)\}$ are complete. The author indicates a method of determining the constants $a_\nu^{(n)}$ in $\psi_n=\sum_{\nu=1}^{n}a_\nu^{(n)}p_\nu$ in such a way that $\psi_n$ approximates the flow in a channel which is given in the $xy$-plane (physical plane), provided that the image of the flow in the hodograph plane is schlicht. The method is a generalization of one given in Duke Mathematical Journal, vol. 6 (1940), p. 537. A similar procedure can be applied in the case of a supersonic flow. (Received July 28, 1942.)

272. Vladimir Morkovin: *On the deflection of anisotropic thin plates.*

Deflections $w$ of an anisotropic plate (with one plane of elastic symmetry) bounded by an analytic curve $C_0$ are considered. The general solution of the differential equation for $w$ is known to be expressible in terms of two analytic functions $f_1(z_1)$ and $f_2(z_2)$, where the complex variables $z_1$ and $z_2$ are related to the variable $z_0$ of the original plane by $z_k=p_kz_0+\bar{q}_k\bar{z}_0$, the constants $p_k$ and $q_k$ depending on the material of the plate. (See S. N. Lechnitzky, Journal of Applied Mathematics and Mechanics, (n. s.), vol. 2 (1939), pp. 181–210.) Transformations $z_k=\omega_k(\zeta_k)$ are found which make any point on $C_0$ correspond to points $e^{i\theta}$ on the circumferences $\gamma_k$ of unit radii in new $\zeta_1$ and $\zeta_2$ planes having the same polar angle $\theta$, and which are conformal in some neighborhoods of $\gamma_k$. Then the functions $\phi_k(\zeta_k)\equiv f_k(z_k)$ can be determined from the two given boundary conditions if these are expressed in terms of $e^{i\theta}$. A detailed solution illustrating this general procedure is carried out in the case of a clamped elliptic plate with polynomial loading. (Received July 31, 1942.)

## Geometry

273. H. S. M. Coxeter: *A geometrical background for the description of de Sitter's world.*

This paper begins with an elementary treatment of the process by which an elliptic or hyperbolic metric in the plane at infinity of affine space induces a Euclidean or Minkowskian metric in the whole space. The various kinds of sphere are defined, and are seen to provide models for non-Euclidean planes, including the "exterior-hyperbolic" plane which is a two-dimensional de Sitter's world. (See Eddington, *The Mathematical Theory of Relativity*, 1924, p. 165.) Then comes a simple proof of Study's theorem to the effect that one side of a triangle is greater than the sum of the other two, and finally a discussion of some cosmological paradoxes. (Received July 31, 1942.)

274. J. J. DeCicco: *New proofs of the theorems of Beltrami and Kasner on linear families.*

Here new proofs of the theorems of Beltrami and Kasner on linear families of