20. A. R. Forsyth, *Theory of differential equations*, Vols. 5 and 6, Dover, New York, 1959.
21. E. Hopf, *The partial differential equation* $u_t + uu_x = \mu u_{xx}$, Comm. Pure Appl. Math. **3** (1950), 201–230.
22. ______, *Generalized solutions of non-linear equations of first order*, J. Math. Mech. **14** (1965), 951–974.
23. S. N. Kruzkov, *Generalized solutions of nonlinear first order equations with several independent variables*. II, Mat. Sb. **72**; English transl. in Math. USSR Sb. **1** (1967), 93–116.
24. P. D. Lax, *Nonlinear hyperbolic equations*, Comm. Pure Appl. Math. **6** (1953), 231–258.
25. ______, *The initial value problem for nonlinear hyperbolic equations in two independent variables*, Ann. Math. Studies **33** (1954), 211–229.
26. ______, *Weak solutions of nonlinear hyperbolic equations and their numerical computation*, Comm. Pure Appl. Math. **7** (1954), 159–193.
27. ______, *Hyperbolic systems of conservation laws*. II, Comm. Pure Appl. Math. **10** (1957), 537–566.
28. O. A. Oleinik, *Discontinuous solutions of non-linear differential equations*, Uspehi Mat. Nauk. **12**; English transl. in Amer. Math. Soc. Transl. (2) **26** (1957), 95–172.

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Surfaces and planar discontinuous groups, by Heiner Zieschang, Elmar Vogt, and Hans-Dieter Coldewey, Lecture Notes in Math., vol. 835, Springer-Verlag, Berlin, 1980, x + 334 pp., $21.00. ISBN 0-3871-0024-5

There is a basic connection between the study of combinatorial group theory and Riemann surfaces which arises as follows: If S is a compact Riemann surface of genus $g \geqslant 2$, then its universal cover is U, the unit disc in the complex plane, and S can be represented as U/Γ where Γ is the group of covering transformations. Γ is generated by $2g$ transformations $a_1, \ldots, a_g$, $b_1, \ldots, b_g$ which satisfy the relation $\prod_{i=1}^{g}[a_i, b_i] = 1$. Here $[c,d] = cdc^{-1}d^{-1}$ and a_i and b_i are Möbius transformations which leave U invariant. The group Γ is an example of a planar discontinuous group and Γ is said to represent S. The single relation above gives a finite presentation of Γ with $2g$ generators. The situation for noncompact surfaces is more complex, but similar.

The book under review begins with combinatorial group theory and develops that part of combinatorial group theory which is relevant to Teichmüller theory and the theory of Riemann surfaces. Teichmüller theory and Riemann surfaces is an interesting field to work in because it lies at the intersection of so many fields: complex analysis, topology, algebraic geometry, differential geometry, combinatorial group theory, and geometric topology. Most of the basic theorems in the subject can be proved using the methods of any one of these fields. When one translates from the language of one field to that of another, different aspects of the theory become either more or less clear and elegant.

An example of where the combinatorial approach is especially nice is the application of the Reidemeister-Schreier methods to the theory of automorphisms of Riemann surfaces: A homeomorphism of a Riemann surface induces