1. M. Cantor *Spaces of functions with asymptotic conditions on* $\mathbf{R}^n$, Indiana Univ. Math. J. **24** (1975), 897–902.

3. ______, *Some problems of global analysis on asymptotically simple manifolds* (preprint).

4. J. Dowling, *Finsler geometry on Sobolev manifolds*, Proc. Sympos. Pure Math., vol. 15, Amer. Math. Soc., Providence, R.I., 1970, pp. 1–10.

5. H. Eliasson, *Geometry of manifolds of maps*, J. Differential Geometry **1** (1967), 169–194.

6. R. Graff, *Elements of non-linear functional analysis*, Mem. Amer. Math. Soc. No. 206, Amer. Math. Soc., Providence, R.I., 1978.

7. R. Hamilton, *Regularity theorems for partial differential operators*, J. Differential Geometry **5** (1971), 39–58.

8. ______, *The inverse function theorem of Nash and Moser* (preprint).

9. D. Henderson, *Infinite dimensional manifolds are open subsets of Hilbert space*, Topology **9** (1970), 25–33.

10. T. Hughes, T. Kato and J. Marsden, *Well-posed quasi-linear second-order hyperbolic systems with applications to nonlinear elastodynamics and general relativity*, Arch. Rational Mech. Anal. **63** (1977), 273–294.

11. T. Kato, *Quasi-linear equations of evolution with applications to partial differential equations*, Lecture Notes in Math., vol. 448, Springer-Verlag, Berlin and New York, 1975, pp. 25–70.

12. N. Krikorian, *Differentiable structures on function spaces*, Trans. Amer. Math. Soc. **171** (1972), 67–82.

13. J. Marsden, *On product formulas for nonlinear semigroups*, J. Functional Analysis **13** (1973), 51–72.

14. R. Palais, *Homotopy theory of infinite-dimensional manifolds*, Topology **5** (1966) 1–16.

15. ______, *Foundations of global non-linear analysis*, Benjamin, New York, 1968.

16. ______, *Banach manifolds of fiber bundle sections*, Actes Congrès Internat Math. **2** (1970), 243–249.

17. J. P. Penot, *Topologie faible sur des variétés de Banach. Applications aux géodésiques des variétés de Sobolev*, J. Differential Geometry **9** (1974), 141–168.

18. P. Sobolevskiĭ, *Equations of parabolic type in a Banach space*, Amer. Math. Soc. Trans. (2) **49** (1966), 1–62.

19. K. Uhlenbeck, *Bounded sets and Finsler structures for manifolds of maps*, J. Differential Geometry **7** (1972), 585–595.

RICHARD GRAFF

BULLETIN (New Series) OF THE
AMERICAN MATHEMATICAL SOCIETY
Volume 1, Number 6, November 1979

0002-9904/79/0000-0515/$03.00

Permanents, by Henryk Minc, Encyclopedia of Mathematics and its Applications (Gian-Carlo Rota, Editor), Volume 6, Addison-Wesley, Reading, Mass., 1978, xviii + 205 pp., $21.50.

The year 1979 can be regarded as the 20th anniversary of the *theory* of the permanent function. True, permanents were introduced in 1812 by Binet [**2**] and Cauchy [**9**], and several identities, usually involving determinants as well, were obtained in the 19th century by some ten other mathematicians including Cayley and Muir. Indeed it was Sir Thomas Muir [**30**] who in 1882 coined the term 'permanent' for the following function defined on $n \times n$ matrices $A = [a_{ij}]$:

$$\operatorname{per} A = \sum_{\sigma} a_{1\sigma(1)} \cdots a_{n\sigma(n)}$$

where the summation extends over all $n!$ permutations σ of $\{1, \ldots, n\}$. True, in 1903 Muirhead [**31**] obtained the following beautiful result. Let $c = (c_1, \ldots, c_n)$ be a positive n-tuple, and let $\alpha = (\alpha_1, \ldots, \alpha_n)$ and $\beta =$