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BULLETIN (New Series) OF THE
AMERICAN MATHEMATICAL SOCIETY
Volume 22, Number 1, January 1990
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0273-0979/90 \$1.00 + \$.25 per page

Etale cohomology and the Weil conjecture by Eberhard Freitag and Reinhardt Kiehl. Springer-Verlag, Berlin, Heidelberg, New York, 1988, xviii + 317 pp., \$98.00. ISBN 3-540-12175-7

It is now some sixteen years since Deligne's spectacular proof [De-Weil I] in June, 1973, of the "Riemann Hypothesis" for zeta functions of projective nonsingular varieties over finite fields completed the overall proof of the Weil Conjectures [We]. For an expository account of all this, see my survey article [Ka].

In the fall of 1973, Deligne formulated and proved [De-Weil II] a far-reaching generalization, which applied to arbitrary varieties over finite fields, and to quite general L -functions on them. It is this generalization, rather than Weil I itself, which has since proven an extremely powerful tool with all sorts of applications, from exponential sums to perverse sheaves.

The book under review is devoted to giving a thorough exposition of Weil I, and of the background material concerning Grothendieck's theory of l -adic cohomology which that paper presupposes. In this the authors succeed admirably. The book does not discuss Weil II at all, except for a two page summary (IV, 5) of some of its main results near the end. Perhaps someday if the authors feel ambitious... .

The excellent 1975 survey article of Dieudonne [Di] on the Weil Conjectures and their solution has been reprinted in the present book as an "historical introduction." Thus the reader has no problem in knowing from the beginning what the "point" of the book is. And if he keeps open a copy of Weil I, which is only 34 pages long, he will not lose his way as he reads through the book. The quality of the exposition is quite high, although the book is (necessarily, being of finite length) not self-contained, and occasionally anachronistic. For instance, on pp. 63–64 Artin approximation (1969) is