

PHYSIQUE

DON HOWARD, JOHN STACHEL (eds): *Einstein and the History of General Relativity*. Basel, Boston: Birkhäuser, 1989. (Einstein Studies, vol. 1). 445 pp.

This is the first volume in a series issued to encourage further research about Albert Einstein and his scientific, historical, philosophical and political context. The series-editors, Don Howard and John Stachel, both have long-term experience with the editing of the Einstein-Papers (for which they took an active part in vol. 1), and they will certainly guarantee for the highest standards for the forthcoming volumes of the series.

The series' pilot volume under review here is based on the Proceedings of the 1986 Osgood Hill conference on Einstein and the general theory of relativity in May 1986. Five of the twenty participants have one and another five have even two papers included in this volume. Furthermore, two scholars who were unable to attend the meeting, the Soviet physicist Vladimir P. Vizgin, and the cosmologist George F.R. Ellis, are also represented in this anthology, the latter with an extremely helpful survey of the history of cosmology from 1917 to 1960, including an extensive and briefly commented bibliography, the former with an

interesting but unfortunately very brief paper on the genesis of the geometrical unified field theory program connected with Einstein, Hilbert and Weyl.

It must be mentioned, however, that many of the papers in this anthology have only been reprinted from history of science journals such as the *Archives for History of Exact Sciences* (Kox, Eisenstaedt), the *Studies in History and Philosophy of Science* (Norton) or from the *Historical Studies in the Physical Sciences* (again Norton), or from manuscripts circulating among the experts for many years now (Stachel). In the case of the two papers by Jean Eisenstaedt about the Schwarzschild solution and "la relativité générale à l'étiage", the English-speaking public will certainly appreciate the fact that we now have the (slightly abbreviated) English translation of them ready at hand – before, Eisenstaedt's papers despite of their great originality and usefulness have too often been ignored simply because of the language problem.

Although a major part of this book only consists in a collection of previously published papers, it was worth while to put them together in such an anthology, since they all mark high-points in the recent scholarship about Einstein and the scientific background of the general theory of relativity. John Norton's paper on "How Einstein Found his Field Equations, 1912-1915" for instance, is a brilliant account of the arduous way in which Einstein worked with heuristical principles such as the fulfillment of conservation laws, the requirements of limiting relations to the special theory of relativity and the Newtonian theory of gravitation, Mach's principle and the syntax of the tensor calculus, to single out the fundamental equations governing the interrelations of matter and space-time. Einstein's temporary loss in confidence to the general covariance which caused a one and a half year delay in his search for a consistent theory, is also dealt with both in Norton's paper and in one of Stachel's contributions specifically dealing with the covariance issue. Of equal importance is Norton's other paper included in this anthology, clarifying the complicated issue of "What was Einstein's principle of equivalence?" in which Norton defends Einstein's statements against those critics who had claimed that Einstein was inconsistent or even plainly wrong in this matter.

'Einstein-Studies' properly understood should not (and will not) be confined to the study of Einstein himself because the *Grosse Männer* approach has obvious shortcomings. Instead they should (and will) seriously attempt to correlate his endeavors with those of contemporaries, some of which are nearly forgotten, today. Therefore it is very encouraging that in this anthology some studies are included which focus not so much on Einstein but rather on his relations with other physicists and mathematicians of those days who are much less explored by historians of science up to now. Cattani and de Maria e.g. studied both Max Abraham, a sharp critic of Einstein dominating the sceptic reception of Einstein's theories in Italy, as well as Tullio Levi-Civita with whom Einstein had an important correspondence in 1915 about the variational approach within the tensor calculus; Biezunski deals with the related issue of the Einstein-Cartan discussion on distant parallelism; Pierre Kerszberg presents the famous Einstein-de Sitter controversy about relativistic cosmology in 1916/1917.

To sum up: The anthology on *Einstein and the History of General Relativity* collects many excellent papers on this subject, some of which are important for their presentation of new document material, others are helpful as experts' reviews of the existing literature (as is the case with Havas on the equations of motion or with Ellis on cosmology). The book therefore gives a good survey on the state of the arts in the history of general relativity and is recommended for reference libraries as well as for physicists and historians of science.