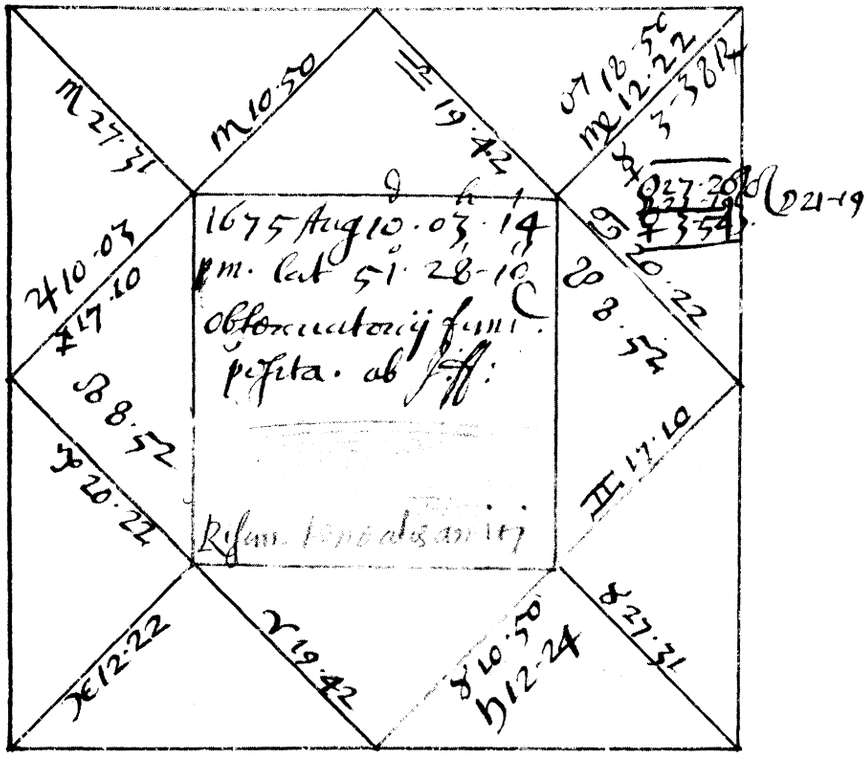

"Horoscope of the Royal Observatory, cast by John Flamsteed, first Astronomer Royal, for the moment of 'birth'—the time the foundation stone was laid by Flamsteed himself—1675 August 10^{d} 03^{h} 14^{m} p.m. He added: *Risum teneatis amici–(May this keep you laughing, my friends).*" [Reproduced in *Francis Place and the Early History of the Greenwich Observatory* from RGO MSS 18/2^{r}]

the position of the stars and the motions of the moon and the planets. The steadfastness of purpose of the astronomers royal and the repetition of observations with ever more precise instruments combined to ensure Greenwich's commanding place in the realm of positional astronomy, and its selection as the prime meridian from which longitude and time are measured.

The 300th anniversary of the founding of the Royal Observatory has been widely celebrated this year. Foremost among the commemorative publications is *Greenwich Observatory*, a handsome, generously illustrated three-volume boxed set. Volume 1, "Origins and Early History (1675–1835)," was written by Eric Forbes, a renowned scholar who has worked closely on such subjects as Tobias Mayer's highly successful lunar theory, and with newly discovered Flamsteed papers. Consequently, the book contains a truly amazing amount of detail, much of which is new, concerning the history of observational and computational techniques and personal and institutional maneuverings; an extensive bibliography provides a useful introduction to other relevant literature. The main arguments of this volume will be difficult for readers lacking a familiarity with the history of astronomy and biographies of the principal actors, however. Volume 2, "Recent History (1836–1975)," written by A. J. Meadows, differs from the first in scope, depth, and intended audience. Aimed at the general reader, it proves a highly readable introduction to general scientific, institutional, and personality matters. None of these, however, is pursued at any great length, and several obvious problems are passed over in silence. The focus of this volume is the mid-19th century and the actions and ideas of the idiosyncratic and quotable George Biddell Airy, next to whom his successors appear pale. Margaret Burbidge, the first female director of the Royal Observatory, rates but six lines. The decision to appoint a radio astronomer to the post of astronomer royal, and to split that post from director of the observatory, is mentioned only in passing, whereas each minor appointment of a Cambridge man to a Greenwich post is noted. Volume 3, "The Buildings and Instruments," is an extensive and useful catalog providing descriptions, methods of use, notes, historical summaries, bibliographies of contemporary accounts, and pictures. The wealth of information it contains is but a reflection of its authorship. Derek Howse, head of the astronomy department of the National Maritime Museum, has been largely responsible for the historical astronomical exhibits developed at Greenwich since the removal of the Royal Observatory to Herstmonceux Castle in Sussex in 1958.

In honor of the opening of the Royal Observatory, Greenwich, in September 1676 Sir Jonas Moore commissioned a pictorial portfolio drawn by Robert Thacker and etched by Francis Place. The set of 12 pictures included a map of Greenwich Park, views from the observatory, eastward across the park and west toward London, a plan of the observatory and prospects of its various sides, and detailed views of the instruments. Of the original edition, which must have been small, only one complete set is now known. In honor of the tercentenary Howse has, in *Francis Place and the Early History of the Greenwich Observatory*, republished the original etchings and supplied a lively historical and iconographical commentary.

The 19 June 1975 issue of *Nature* contains seven essays in a section headed "300 years of Greenwich." In their contributions Eric Forbes and A. J. Meadows present succinct summaries of the arguments developed in *Greenwich Observatory*. A. Hunter, the current director, describes the work at Greenwich in the 20th century; and F. Graham Smith, director designate, surveys the next 300 years. Two essays concern English astronomy before and at the time of the establishment of the Royal Observatory, and one relates various Greenwich anecdotes.

The fourth Greenwich tercentenary publication under review, *The Royal Greenwich Observatory*, is simply a historical chronicle of staff, buildings and apparatus, observations and research.

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North American Prehistory

The Archaeology of Missouri. Vol. 1. CARL H. CHAPMAN. Illustrations by Eleanor F. Chapman. University of Missouri Press, Columbia, 1975. xiv, 288 pp. $20. University of Missouri Studies, 62.

In 1934 Carl Chapman was among the founding members of the Missouri Archaeological Society, and since 1946 he has held the directorship of American archeology at the University of Missouri. This study is thus the culmination of a career devoted to research on the topic and to the development of both a vigorous university program and one of the most effective state amateur programs. The utility and importance of the amateur programs are readily seen from the substantial portion of the data reported in the volume that are provided by materials from private collections.

The book covers a time span ranging

from the earliest known occupations to the end of the Archaic at approximately 1000 B.C., when the hunting-gathering economies were transformed by the acceptance of plant cultivation. Chapman makes use of a sequence of four periods and for each characterizes the cultural traditions present in each of five physiographic regions of the state.

His Early Man period, ranging from the time of man's first entry into North America up to 12,000 B.C., is characterized by an unspecialized hunter-gatherer tradition and is based largely on evidence derived from outside the state of Missouri. Even though these dates and associations have been the center of much controversy, Chapman synthesizes them into a new hypothesis regarding the migration of peoples from Asia to America. He suggests that, perhaps as early as 40,000 years ago, the first migrants moved down the west coast of North America by boat. These nomads brought with them a technology of stoneworking that included the production of bifacial laurel-leaf and bipointed projectile points or knives, these being the basic forms from which others, such as the distinctive fluted points, were derived. Inland penetrations from the early coastal migration occurred in the Puget Sound region and the Columbia River valley, but it was mainly in central Mexico that there were rapid movements inland and a population explosion. It was a later movement northward from Mexico in the Early Man period that provided the initial peopling of the eastern United States. The Early Hunter tradition of Chapman's Paleo-Indian period (12,000 to 8,000 B.C.), known in Missouri mainly from the distribution of fluted points that are the local equivalents of Folsom and Clovis, represents a complex whose region of origin he does not specify except to place it somewhere in a broad region from Mexico and the southwestern United States to Florida. This tradition manifests an adaptation to hunting land-based big game at a time as late as 18,000 to 16,000 B.C.

While the Early Hunter period is seen as a time of cold climate in Missouri, the Dalton period (8000 to 7000 B.C.) spans a shift to temperate conditions and the beginning of a transition from hunting to foraging as a primary means of subsistence. Only with this period and the subsequent Archaic (7000 to 1000 B.C.) do excavated sites yield a wider range of artifactual data. The Foraging tradition of the Archaic is marked first by a broadening of subsistence activities, with an increase in the importance of small game animals relative to the moderately large ones that provided more of the diet during the Dalton period. Only by the Late Archaic period (3000 to 1000 B.C.), when climatic conditions were drier, do we see a shift to a greater use of vegetable foods and an appropriate tool technology for their exploitation.

Whether or not Chapman's hypotheses are accepted, they will stimulate discussion and refinement of a broader interpretative framework. On the local scene, the lavish illustrations—comprising both excellent photographs and drawings accompanied by an appendix describing the major types of projectile point, the most distinctive implement found on the early sites—make the volume useful as a guide to identification of forms and traditions. Chapman has fully documented his account of Missouri archeology, previously covered only in popular handbooks, and has provided a stimulating challenge to some of the accepted ideas of his professional colleagues.

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Bacterial Viruses

RNA Phages. NORTON D. ZINDER, Ed. Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y., 1975. x, 428 pp., illus. $28. Cold Spring Harbor Monograph Series.

In the development of our understanding of gene action at the molecular level bacterial viruses (bacteriophages or phages) have held a preeminent place. Much of what we know about mutation, nucleic acid replication, genetic recombination, and gene expression at the transcriptional and translational levels has been the result of precise genetic and biochemical experiments with bacterial viruses, beginning with the T phages of *Escherichia coli* in the 1940's and continuing with coliphage lambda and even simpler phages. Among those viruses whose study has contributed so much are the tiny RNA-containing phages specific for male strains of *E. coli* discovered in 1960 in the sewage of New York City by Tim Loeb and Norton Zinder. I well remember the excitement at the Rockefeller Institute when one of their isolates was found to have an RNA genome. This discovery came at a time when investigations of the replication of RNA animal viruses (such as poliovirus) were already hampered by the technical and biological complexities of animal cells in culture; with an RNA virus that reproduced in the well-studied *E. coli* one could expect rapid progress. Moreover, Nirenberg had just succeeded in showing that *E. coli* extracts could be programmed to synthesize specific polypeptides in response to added polyribonucleotides. If the phage RNA served as a messenger for protein synthesis in such extracts, a pure, natural messenger RNA would be readily available for use in the analysis of the complex process of protein synthesis. That all of these early expectations—and more—were realized in the ensuing years is documented in *RNA Phages*.

The book is a collection of reviews (14 in all) summing up more than a decade of active research on nearly all aspects of RNA phages, including the physical and chemical properties of the phages and their RNA and proteins, phage genetics, the early interactions between phage and *E. coli*, replication of phage RNA, protein synthesis directed by phage RNA and its control, morphogenesis of phage particles, and RNA phages of bacteria other than *E. coli*. The layout of the volume is attractive, the print is large and easy to read, and the figures are clear except for the electron micrographs, many of which are poorly reproduced. A few chapters are summaries of research from a given author's laboratory and contain a good many primary data; most are broader reviews of specific subjects. The latter should be particularly useful, for nearly all of them are succinctly written and amply referenced. The review by R. I. Kamen on the structure and function of RNA replicase is an especially lucid account of the subunit structure of this complex enzyme, which, as was first shown by Spiegelman and his colleagues, specifically replicates phage RNA. What role each of the subunits plays in the replication process is one of the most important unanswered questions in the RNA virus field. As is inevitable in a review volume dealing with an active field, a few of the articles (some of which were written in 1972 or 1973) are no longer up to date. Two examples are the chapter by J. A. Steitz on ribosome recognition of initiator regions in the phage genome and the chapter by W. Fiers on nucleotide sequences of phage RNA. (At the time of writing, the nucleotide sequence was about half completed, but it is now complete.) Nevertheless, these two chapters are among the most interesting in the book, for they illustrate how nucleotide sequence data on phage RNA have provided a deeper understanding of the mechanisms of translational control and point up the importance of this approach to future efforts to understand replication of phage RNA. Perhaps also inevitable in a field in which problems have been approached from different angles by a sizable number of able investigators are the extensive overlap and repetition evident in some of the chapters. There are also a few omis-