will be over. However there will be many more sources needing spatial, spectral, polarimetric and 350-micron studies; those observations together with the development of appropriate instrumentation will be the main preoccupation of infrared astronomy with UKIRT during the eighties.

Dr P. M. Williams. The principal contribution of infrared observations to Galactic astronomy is in the study of the interaction of stars with interstellar matter. This occurs at the least-understood phases of stellar evolution—star formation and star death. For example, observations of novae have aided the study of their expanding ionized envelopes through their free-free emission, and the condensation and growth of solid particles through their thermal radiation. The evolution of cool giants to planetary nebulae has long been studied theoretically. Now, three sources (IRC+10 216, CRL 2688 and CRL 618) discovered in infrared surveys have been identified with successive stages of the evolution of a proto-planetary nebula. Symbiotic stars like V 1016 Cygni may be related to these but are probably also binaries. Infrared observations of mass-exchanging binaries help us to locate interstellar streams and circumstellar disks or shells. Above all, infrared observations of embedded stars and protostars have transformed the study of star formation.

Dr C. C. Wynn-Williams. Extragalactic objects are generally faint at infrared wavelengths. All the sources we know about were found as a result of a specific observation, rather than as a result of an unbiased search. Consequently there are strong selection effects in the type of objects studied. Emission from heated dust grains is found from some nearby spiral galaxies including our own, and from Type II Seyfert galaxies. On the other hand variable non-thermal emission, probably synchrotron radiation, is emitted by Type I Seyfert galaxies and by quasars. The most useful tool that UKIRT can do both now and in the post-IRAS era is detailed studies of these objects. Accurate sizes and positions are needed, since many extragalactic objects are extended on a scale of a few arc seconds. Photometric observations of energy distributions and variability will help to distinguish thermal from non-thermal processes, as will polarimetric studies. Spectroscopic observations also hold great promise; infrared spectra of M82, for example, now allow us to study hydrogen emission lines, ionic fine-structure lines, molecular absorption features and dust emission features in the optically-invisible nucleus. The high spatial resolution and sensitivity of UKIRT make it an excellent telescope for use in extragalactic research.

Dr D. K. Aitken. In the field of low-resolution infrared spectroscopy, using filter-wheels and gratings, three main areas of interest have emerged. The first of these, the study of atomic emission lines from planetary nebulae, H II regions, and some galaxies, has improved our knowledge of the abundance of neon and sulphur in these objects and at the Galactic centre, and led to a better understanding of their structure. Second, spatial studies of local regions using radio-synthesis observations and enable studies of objects with much higher electron density. Only a few sources have so far been studied in this way. Recent observations of molecular hydrogen in the two-micron region from a few sources have revealed surprisingly high excitation temperatures of about 2000 degrees K. Possible excitation mechanisms include shock heating close to ionization fronts. Thirdly, the study of continuum features in emission and absorption has led to the fairly conclusive establishment of silicate materials as a major constituent of interstellar and circumstellar dust, and has also presented astronomers with a number of pronounced but puzzling features at 3.3, 3.4, 6.2, 7.7, 8.7 and 11.3 microns. These features have been seen only in emission, have no conclusive laboratory identification, and exhibit no clear correlations among the few sources so far observed to possess them. It seems likely that studies of more sources with higher spatial and spectral resolution will help in understanding these problems.

Dr M. J. Smyth. For spectral resolving powers over one thousand in the infrared, and approaching one million in the visible, interferometers of the Michelson or Fabry–Pérot types are required. In the visible these types are competitive; both are being developed at Imperial College for installation at the Coude focus of UKIRT. I show Dr R. Wayne’s recent Michelson spectra of the hyperfine splitting of the interstellar sodium line. In the infrared, the Michelson spectrometer has an overwhelming signal-to-noise advantage. It has been developed to a high degree of perfection by P. Connes of Paris, and he hopes to install an upgraded version of his latest instrument at UKIRT for collaborative use with British spectroscopists; we are already processing his data on the Edinburgh regional computer. High-resolution infrared spectroscopy opens up many fields of astronomy beyond the scope of broad-band photometry—molecules, isotopes, motions and mass loss in stellar atmospheres; the orbits of cool companions in close binaries; interstellar molecules, including H2; emission lines in highly-reddened objects, H II regions, and planetary nebulae; and trace constituents in planetary atmospheres. The instruments to be installed on UKIRT should provide outstanding opportunities in these and other fields of high-resolution spectroscopy, which was one of the principal applications for which the present generation of large flux collectors was first proposed over ten years ago.

THE TWENTY-FIRST HERSTMONCEUX CONFERENCE
DIGITAL METHODS IN ASTRONOMY

1978 June

The Twenty-first Herstmonceux Conference

1977 September 21 and 22

The meeting was opened by Professor F. G. Smith, who, having welcomed the visitors, asked Professor King to deliver the opening talk entitled "The Berkeley Astronomical Data Processing System".

Professor I. R. King. The astronomical data processing system at Berkeley began with a PDS microdensitometer. It was recognized at the outset, however, that the processing of PDS data would require much more computing strength than does the mere control of the machine. A PDP–11 system of considerable power was therefore installed. It soon became evident that the system would be valuable for all sorts of data reduction, and the Radio Astronomy Laboratory switched its data reductions to the PDP–11. Soon there was a shortage of computing time, but by then we were saving so much computer money (through not paying for time elsewhere) that it became possible to pay for an upgrading of our own system, so as to serve two time-sharing consoles, with a much larger core and disk memory.

The large core memory not only serves the two users; it also allows a larger but slow operation (such as measuring with the PDS) to operate simultaneously in the background. An added advantage of the large disk is that it allows users to consult and exchange files easily. We have found it essential