thing in common however — on those issues where they came into conflict with the Darwinians, they eventually lost out. They may have been losers, but at least some of them were big losers.

As Bowler reminds us, Darwinism originally included Lamarckian inheritance as a subsidiary mechanism. Both Herbert Spencer and Ernst Haeckel were confirmed Lamarckians. Not until August Weismann purged Darwinism of the inheritance of acquired characters did Darwinians and Lamarckians become opponents, much to the dismay of such pluralist Darwinians as George John Romanes. As Bowler also notes, we tend to forget that early Mendelians were just as opposed to Lamarckian and Darwinian theories of evolution. During the first decade of the century, the Mendelians became the gatekeepers of biology. Any theory that could not come up to their standards was put in jeopardy. Lamarckism was defeated not by the Darwinians but by the Mendelians. The Lamarckians lost because they refused to divorce their theory of evolution from embryology. The Darwinians survived because they were willing, at least for the moment, to ignore embryology and ally themselves with the overly simple views and extremely successful methods of Mendelian genetics. Later they would put organisms back into evolution.

One factor that Bowler suggests to explain the eclipse of Darwinism is the polarization produced by Weismann's "dogmatic" emphasis on natural selection to the exclusion of all other evolutionary mechanisms. The inflexibility of the resulting neo-Darwinians gave birth to the neo-Lamarckians and guaranteed that they would be enemies. Bowler tells a parallel story for dogmatism about gradual (continuous) versus saltative (discontinuous) evolution. Bowler's choice of words implies that flexibility is inherently superior to dogmatism, but both are strategies and as such are sometimes successful, sometimes not. In science as in biological evolution, rigidity is not always a vice and flexibility not always a virtue.

Bowler's carefully documented book gives precious little support to those who think that great scientific theories spring full blown from the brains of great scientists and remain essentially unchanged thereafter. Although Darwinism underwent periods of retrenchment when certain Darwinians pruned the luxuriant pluralism of their theory, just about every imaginable view has been part of Darwinism at one time or another. Although Goldschmidt's "hopeful monsters" were ridiculed by such founders of the Synthetic Theory as G.G. Simpson and Ernst Mayr, the "hopeful populations" of Mayr, Niles Eldredge and Stephen Jay Gould are rapidly becoming part and parcel of the *new* New Synthesis.

Bowler also offers scant solace to the more extreme social determinists. Any scientific view seems capable of justifying any social policy. For example, Spencer was both a Lamarckian and a strong advocate of *laissez-faire* individualism. Bowler concludes that those opponents of modern selection theory who "dismiss it as an expression of blind materialism or capitalist ideology should pause for a moment to think that if it were not for the triumph of the modern synthesis, their own alternative might still be burdened with equally distasteful implications" (p.221).

Construing science as nothing but a series of success stories is surely misleading, but Bowler, in attempting to compensate, also tends to bias the picture. Scientists are frequently quite stubborn. If they were not, they could not begin to overcome the tremendous inertia which they frequently confront. When they turn out to be right, we admire their stubbornness. Bowler's litany of stubborn adherence to views that we now take to be mistaken tends to get a bit depressing. Science moves so fast that most of the scientists whom Bowler discusses lived long enough to see the scientific community move out from under them. The resulting bitterness and petulance is also none too attractive, but Peter Bowler's antidote to the relentless exaltation of traditional histories of Darwinism is as necessary as it is sometimes distasteful. □

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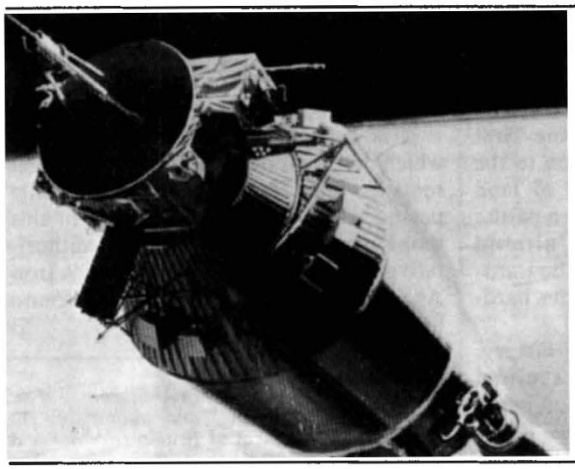

GLIMPSE of 1986 — an artist's impression of the International Solar Polar Mission spacecraft (which is now completed) atop a Centaur upper stage after its deployment from the Space Shuttle. The illustration is taken from a new publication of the European Space Agency, *The International Solar Polar Mission — Its Scientific Investigations*, which previews the work to be carried out by the ISPM. The publication (ESA SP-1050) is available from Scientific and Technical Publications Branch, ESTEC, Noordwijk, The Netherlands. Price is 175FF.

Full of Fourier

H. Lipson

Fourier Optics: An Introduction.
By E. G. Steward.
Ellis Horwood/Wiley: 1983. Pp.184.
Hbk £15, $25.95; pbk £7.95, $13.75.

OVER the past three decades there has been a revolution in physical optics. In the 1950s it was generally held that it was a finished subject: we knew all that we needed to know and while optics was still a necessary part of a physics curriculum, no creative ideas could be expected to arise in it.

However, developments were taking place. The Dutch physicist, Fritz Zernike, deliberately chose to devote himself to optics rather than to the more fashionable topics; he generalized the concept of coherence and, in 1935, invented the phase-contrast microscope. In 1960 Maiman made the first laser, which astounded the scientific world, giving a beam with practically infinite coherence. This finding was seized upon by Leith and Upatnieks in 1962 to make workable the hologram idea introduced by Gabor in 1942. Optics had been rejuvenated and now anyone who wishes to consider himself a physicist must know something of these new ideas.

This book will be extremely helpful in introducing these approaches. The name Fourier dominates the contents, illustrating in addition how the different branches of physics are interdependent; Fourier, of course, was concerned with heat transmission, not optics, but now his mathematical idea is used in almost every branch of physics.

I think that the book succeeds very well. The style is pleasantly informal but nonetheless quite explicit. The author has thought deeply about the presentation of the subject. Fourier transformation and convolution are clearly described and are applied to explanations of optical imaging and processing, subjects that have made great strides in recent years. In the final chapter, which is concerned with instrumentation, the name of Michelson looms large; the use of Fourier methods in the interpretation of the patterns from the spectral interferometer is perhaps one of the most surprising outcomes of Fourier's ideas.

The only criticism I have of this section is that there is no clear explanation of the way in which fringes are formed in the interferometer, and the problem of localization of fringes — always difficult to explain to students — is not dealt with at all.

In all, however, the book is very readable and will be most useful to anyone who wishes to keep up to date with modern optical ideas. □

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