

Stars, listed and mapped for a new epoch

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Sky Atlas 2000.0. By Wil Tirion. ISBN 0-521-24467-6. (Cambridge University Press/Sky Publishing: 1982.) £15, \$29.95.
Sky Catalogue 2000.0. Volume 1, *Stars to Magnitude 8.0.* Edited by Alan Hirshfeld and Roger W. Sinnott. Pp.604. Hbk ISBN 0-521-24710-1; pbk ISBN 0-521-28913-0. (Cambridge University Press/Sky Publishing: 1982.) Hbk £32.50, \$45; pbk £14.95, \$29.95.

ATLASES and catalogues of the sky have one important characteristic for the publisher, and that is they get out of date quickly. The poles of the sky move, thus slowly changing the stellar co-ordinates. This is indicated by the epoch figure 2000.0 in the titles of the two books under review. The star positions given in the atlas and catalogue are only correct for that date. The last epoch was 1950.0 and these two books are the first comprehensive works for the new co-ordinate epoch. The pole does not move very quickly, the precession about the vertical to the Earth's orbital plane taking about 25,750 years, but still astronomers like being up to date and like to have the latest atlas and catalogue to hand.

The second thing to say about Tirion's atlas is that it is a joy to the eye. The sky is divided into 26 areas each represented by a chart measuring 12¼ by 17¾ inches. Stars are represented by black dots which decrease in size as the stars get fainter. Galaxies are red, nebulae green, clusters yellow and the Milky Way is represented by two shades of blue, following Pannekoek's isophotes. Secant conic and secant cylindrical projections are used which reproduce the constellation figures with minimum distortion. The labelling is clear. Simply to see this book is to want it.

The charts contain some 43,000 stars down to visual magnitude 8 and about 2,500 deep-sky objects. Brighter stars are labelled with both their name and their Bayer letter and Flamsteed number. Deep sky objects have their NGC or IC number as well as their Messier number. The Andromeda galaxy is, for example, shown as 224.M31.

Volume 1 of the *Sky Catalogue 2000.0* starts with an extremely useful ten-page introduction which is followed by 600 pages of tables. Each line in the table refers to one star, and 45,269 are tabulated. The brightest, Canopus, is 40 million times more luminous than the faintest, HD 153336. Thirty-seven thousand of them are visible with the naked eye from Earth. Following normal practice the stars are listed in order of increasing right ascension. Henry Draper and Smithsonian Astrophysical Observatory numbers are given, as are the name (where applicable), right ascension, declination, proper motion, visual magnitude, colour index, absolute visual magnitude, spectral type, MK type,

radial velocity and distance. An example of the care taken by the authors is indicated by the way in which the distances are labelled according to whether they originate from trigonometric or spectroscopic parallax techniques or are just maximum or minimum values. Ninety-one per cent of the stars in the catalogue have their distances given.

The great chain of non-being

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Plurality of Worlds: The Origins of the Extraterrestrial Life Debate from Democritus to Kant. By Steven J. Dick. Pp.246. ISBN 0-521-24308-4. (Cambridge University Press: 1982.) £19, \$34.50.

WHY should fairies be intrinsically any more absurd than Astrans? Partly, it is obvious, because the bottom of the garden is easier to inspect than even the planets of our own Solar System, and partly because the non-human qualities of pixy or fairy make this kind of being fantastic while we may imagine Astrans to be just as human-like as we wish. Indeed, the very principle of universal similitude which encourages us to contemplate the existence of Astrans — or in earlier days Lunatics and Martians — requires us, in starting from the assumption that these creatures are living, sentient and intelligent beings, to suppose them in some recognizable measure of behaviour to be like ourselves, however morphologically unfamiliar. The same argument applies to the imagination of extra-terrestrial animals and plants: a Venusian tree that runs, or an Astran flying elephant, are just as absurd as if we placed the same creatures in some unexplored Amazonian backwoods.

Nonetheless, for living things of all kinds the principle of universal similitude remains to this day an unsupported speculation. It is a principle, common to Epicurus and Hoyle, resting on a metaphysical belief that nothing in the cosmos can be unique, which many (including presumably most if not all religious believers) regard as unacceptable. In its original form, as adopted by the Greek atomists, it embraced the idea that no substance and no type of being can be unique, since everything is subject to probability and the occurrence of an event in one place does not reduce the likelihood of its repetition there or elsewhere. Hence time's arrow pointed in all directions at once as on a three-dimensional compass-card or, more exactly, must be interpreted as having but a local and reversible effect.

Still to come, to complete the set, is Vol.2 of the *Sky Catalogue* which will describe in full the multiple and variable stars as well as the clusters, nebulae and galaxies. This is due to appear early next year.

Both the *Sky Atlas* and the *Sky Catalogue* are beautifully produced, good value for money and in my opinion essential acquisitions for all active astronomical observers.

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Accordingly, the metaphysical rejection of singularity — and indeed the principle of universal similitude itself — are inconsistent with such an attribution of time-direction to the cosmos as the prevailing scientific view of its evolution seems to require; but as Dr Dick's consideration stops with Kant in the late eighteenth century, the relation of the Perfect Cosmological Principle and of the Primordial Bang to universal similitude falls outside his scope.

Throughout late antiquity and the Middle Ages Aristotle's rational arguments for a finite universe and a unique Earth held sway, though latterly mitigated by the contention, founded on God's omnipotence, that the creation of more universes than one was within his power. However, since it seems that mediaeval philosophers regarded such alien universes as in principle unobservable — surely a logical position to adopt — the assertion or denial of their existence was meaningless except perhaps in a theological sense. Then, as Dr Dick emphasizes, the Copernican revolution opened the door to a more effective version of universal similitude in that the Earth was now seen as a member of a class of bodies, planets, and later the Sun was placed in another class, stars. Since then, and with renewed emphasis from Newton, universal similitude has become a firm principle in thought about the physical structure of the cosmos though, paradoxically enough, the progress of scientific investigation has always increased rather than diminished our sense of the diversity within the classes of stars and satellites. Whereas the seventeenth century could (with some little violence to observation and plausibility) imagine the Moon as not at all unsuited to the existence of intelligent living beings, and the nineteenth century could similarly view Mars, we now recognize that the chances of finding another Earth-like planet, if finite, are quite small. The fact is that our search for analogues in the cosmos has had to be pushed ever further and