Part 11. Conference Summary and Resolutions

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THE NATURE AND SIGNIFICANCE OF SURVEYS

Summary of Panel Discussion

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Abstract. We present here some of the ideas and questions mentioned by the panelists and other participants during the discussion that immediately preceded Ofer Lahav's concluding remarks. Official panelists were George Djorgovski, Michael Disney, Ofer Lahav, and Virginia Trimble (chair). The topics of the posters are very briefly summarized as well.

1. Do We Really NEED Surveys

What is a survey? A large, systematic assemblage of data for which someone else will get more glory than the people who did the assembling and systematizing. It is with this in mind that the recommendation was made to dedicate the proceedings to George Ogden Abell and Albert G. Wilson, who took virtually all the plates for POSS I.

How many surveys are there? According to N.G. Roman's poster, there are already well over 300 in the ADC data base. S. Okamura's summary for IAU Commision 28 (triennial report) records 499 extragalactic atlases and surveys published in the three years ending 30 June 1996 (though some of these are quite specialized, like isolated pairs of galaxies in the southern hemisphere and intracluster gas temperature).

How many surveys should there be, or, as R.E. Williams asked it, what fraction of telescope time should be devoted to surveys? This is exactly the sort of question that Working Groups exist to answer (or, at least, discuss), as are the next several. Most participants seeme to agree that the answer is "more"—but not at the expense of our own more specialized projects.

How many surveys do we really need? M. Disney suggested 19, based on dividing up the electromagnetic spectrum into suitable slices. But, realistically, this is very much a lower limit, since one cannot as a rule take care of all the necessary ranges of temporal, spectral, and angular resolution,

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lines vs. continuum, and point vs. extended sources with a single survey at a given wavelength. This increases the necessary number to 42 or 63 or whatever your favorite might be.

Which "windows" are currently more opaque than they need to be and so most in need of surveys? This was raised by M. Harwit, and suggested answers including HI 21 cm (from the southern hemisphere), the lowest reachable radio frequencies (from space for less than 1 MHz, mentioned by Lahav), the submillimeter (300 μ) region, and the vaccuum ultraviolet near 1000Å. In fairness, however, one should remember that there are periodic opportunities in both the USA and Europe to put proposals to do these into the potential pool along with other, perhaps more popular wavelength bands.

Was the universe created at optical wavelengths? This was Jasper Wall's phrasing of the feeling we all have that an astronomical object doesn't really exist until there is an optical identification. The relevant passage in Genesis indeed says: *Vayomer Elohim, y'hi* or *(and God said, let there be light).* That this should surely be interpreted to include all forms of electromagnetic radiation (and probably static magnetic fields as well) does not vitiate the point that we continue to find more information (spectral lines for measurement of composition, redshift, and all the rest) at the energies where most atoms have some excited, but bound, electrons.

How much redundancy is appropriate? POSS I has been scanned and digitized at least three times. Is this too many, too few, or just right? And, looking ahead, for instance, how much support should be provided to balloon groups that want to map the 3K background not quite so well as will be done by MAP and COBRAS/SAMBA, but earlier?

2. Science from Survey Archives

How can we promote access to archived data? Should data bases be centralized or distributed among sites? And how can we make good use of the multiplicity of surveys at many wavelengths that are or soon will be available? No one provided any very profound answers to these questions (though we all admire the problem, and some NASA experience indicates that 10% of a project cost needs to be set aside for long term storage and accessing). Notoriously, archiving is cheap, retrieval is expensive.

Are there lessons to be learned from other massive data bases? Disney mentioned the European cancer registry (apparently assembled at considerable cost and not yet much used for anything, though national analogs are heavily exploited to look for all kinds of correlations with demographic variables). Images from particle colliders are not a good model. They are normally looking for needles in haystacks, while our surveys are practically

all needles. And then there is the Human Genome Project, about which we all agree that it is a Good Thing, though not perhaps about why.

What are the implications of massive, electronically archived surveys for the way astronomy is done and the kinds of people who will be successful astronomers in the future? A number of participants expressed thoughts and worries that are widespread in the community. Will we give PhDs to people who know only how to handle a given image processing system very skillfully? Will there still be astronomers who know how to build things and make them work? There had better be, but how do we reward these people, given the publication-oriented structure of academic science? Very possibly there has already been a shift from a pre-dominance of solitary observers to younger astronomers who prefer to work in groups? Will they still generate the kinds of new ideas that we historically associate with mavericks? How can the inventor of an idea be identified and rewarded if all papers are published as "Aardvark *et al.*, on down to Zyzygy" And, finally, given that an astronomer anywhere in the world now has access to much the same data as staff members at NRAO, Keck, or GSFC, there is surely an opportunity for people who are skilled in handling "large, systematic assemblages of data" to do their own thing, wherever they may be, somewhat leveling the traditional playing field.

3. Posters

At any given conference, the poster contributions provide a glimpse of the near future, since many represent work in progress, quite often work by graduate students and postdoctoral fellows. Of the 105 posters I read (all but a couple that were either never put up or were taken down in the first two days), the distribution of subject matter was roughly the following:

- Eight concerned reprocessing or other reconsidering of old surveys (including the use of the Carte du Ciel catalogue for proper motions).
- Applications of completed surveys (Einstein Medium Deep, IRAS, *etc.*) to finding new objects or classes of objects appeared in 25.
- Surveys under way were the topic of 31 (DENIS, SDSS, and many others).
- Seven posters dealt with techniques for processing, archiving, or retrieving survey data (SkyView is a particularly interesting case).
- Multiwavelength applications (beyond merely finding optical identifications) appeared in 15 posters, including some with the most spectacular graphics.
- Surveys that could conceivably be carried out from ground or space (if only the money/equipment/satellite/*etc.*, existed) were the topics

of 12 posters. (My mother used to say about such things that, if the sky falls, we'll all catch larks.)
– Seven dealt with other, non-survey, topics.

Perhaps the most striking aspect of the poster presentations was the very high technical quality. Almost no-one simply tacked up his preprint. And many of the color images were impressive as art as well as science. Future conferences on topics like this one should perhaps consider publication of a CD/ROM as well as a book of proceedings to accomodate these presentations.