

Introduction

INTRODUCTION TO THE ISSUES

DAVID L. CRAWFORD
Kitt Peak National Observatory¹
P.O. Box 26732, Tucson, AZ 85726 U.S.A.

ABSTRACT Astronomy is facing a present and future severe problem with adverse environmental impact, just as is the rest of mankind. While we all suffer from air and water pollution, amateur and professional astronomers are finding the universe disappearing from view, due to light pollution, radio interference, and space junk. We must build awareness of these issues and seek solutions.

Environmental impact is a major topic of discussion in the world today. We read about, and see, and live with the problems of air pollution, water pollution, toxic waste, acid rain, oil spills, and all these really nasty things. Few individuals or countries are immune. These problems have several elements in common:

1. They are being produced by mankind.
2. They are harming mankind, at least in some areas.
3. The impact is growing rapidly.
4. If not checked, eventually mankind will self-destruct.

The topics we are going to be discussing over the next four days are similar to the environmental threats listed above. While the ones we deal with in astronomy will not in themselves, even if unchecked, lead to mankind self destructing, as other pollution items will, they are part of the same disease. Mankind is insensitive to the environment it lives in and is dependent upon for survival. A basic cure for all of these is to increase our awareness of the environment we live in, and of the threats to it.

It is encouraging to see over 100 attendees from the astronomy community, the lighting industry, and others here, but that number is really only a small fraction of the communities involved. Even those most strongly affected by the environmental threats are often either unaware or are unwilling to devote any time to increasing their awareness or their involvement in the issue. It is our goal to change that. Are there any extragalactic astronomers here whose work depends critically on dark skies?

While the problems we will be discussing affect professional astronomy directly, they also affect amateur astronomers and the general public. Astronomical research is already severely affected in some locations, and it is only

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Astronomical research is already severely affected in some locations, and it is only a matter of time until all locations, on earth or in space, will be so affected. As with air pollution and water pollution, we must cure the problems if we are to survive.

Some may ask, and they do, why bother with light pollution, radio interference, or space debris? These are not harmful to mankind as a whole, and what use is astronomy anyway? Well, first of all, they do affect mankind adversely, as some of the later talks will show. But the view of the universe is worth protecting even without astronomy. Such a view, from a prime dark site, is one of nature's most wonderful marvels. Few have seen such a view and not been deeply impressed. Face it, astronomy is a philosophy and an art as much as it is a science. Considerations of the universe, what it is, what it means, what's out there, are fundamental thoughts. Without the view of the universe, these are lost. And, if lost, it will add to the decreasing sensitivity that mankind has to the "universe" and the environment around itself. I urge one to read "Earth" by Anne and Paul Ehrlich, if you haven't, for insight into such questions about ecology and the environment. These are key issues for the future of mankind.

The Hopi Indians had a word, *koyaanisqatsi*, which means "nature out of balance." It fits well to the issues at hand. Glare, clutter, light trespass, urban sky glow, RFI of all sorts, space debris and space shrapnel are all examples of *koyaanisqatsi*. Many of these are bad now; all are growing worse. Without controls and planning, growth will accelerate.

The impact will be most severe, of course, on future generations. They will face the specter of not ever seeing the universe "live," but only on a planetarium screen or on TV. In fact, that is the only way that many now see nature, on TV. Theorists may be able to continue doing research without observations as a check, but I doubt it. There is no question in my mind that this lack of sensitivity to the environment is at the root of mankind's apparent effort to destroy that environment, taking all species including mankind down as well.

Do I sound like an evangelist? I am. But those other guys have more fun, it seems, and they certainly do raise more money for the cause they are evangelizing for.

As an aside about my sensitivity to the issues: Aldo Leopold wrote the following about the ecologically knowledgeable who find themselves debating endlessly with others who believe that humanity can continue forever in its present growth-maniac course: "One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on land or the environment is quite invisible to laymen. An ecologist must either harden his shell and make believe that the consequences are none of his business, or he must be the doctor who sees the marks of death in a community that believes itself well and does not want to be told otherwise."

I feel often that I have the same problem. I can not be out at night now without being sensitive to all the poor lighting in communities. Others who have become aware of the advantages of quality lighting, and the problems with poor lighting, feel the same, whether they are astronomers, lighting engineers, or laymen. I just cannot close my eyes to it all, though it is painful, and of my involvement in pushing for light pollution controls has destroyed forever the possibility of being out at night without wincing hundreds of times in pain. I hope we can educate all others in the world to suffer like I do, to be aware.

We must educate others to the problem. We must push for regulations to control the problems. We must get action. To quote again from the Ehrlichs' book: "We cannot plan for a world populated by saints when humanity has shown precious little tendency to change its behavior in that direction. Indeed, one could argue the exact reverse." Regulations, legislation, and laws are usually needed. There will be restrictions of freedom, but that has become a necessity for the common good.

I feel that the papers we will hear will help us understand better the issues.

There are many more benefits to the meeting, however. In some ways, I feel that the biggest plus of the meeting will be the fact that we have, in a limited but useful way, brought together interested and involved individuals from the different communities, optical and radio and space astronomy, the lighting and radio industries, amateur and professional astronomers, the general public, the media, and others. There have been meetings covering subsets of the overall issue, but none that I know of bringing together representatives of so many of the subsets interested in and working for solutions to the wide range of environmental impacts on astronomy. We have made a beginning. There is much more to do, but we are on the way. I hope to see most of you, and others, at future such meetings. We need more people involved. (Hear the paper about the International Dark-Sky Association later in the meeting.)

Let me with close these summary statements, offered as an Introduction to the Issues, with a few statements that I feel are correct. As we hear the papers over the next few days, and discuss the issues with each other, think about them. Are they correct? Are they things that we can say to others with certainty?

1. Astronomy is currently badly affected by a number of "environmental" impacts: Poor lighting, RFI, space debris, and other issues.
2. The situation is getting worse.
3. These impacts also affect the general public.
4. While in some areas, such as at remote observing sites, or in the potential for collisions in space, the current problem is not severe, there is no question that it will become so, given the current rate of growth of the problem and the lack of sensitivity to the issues. Astronomy must view things with a long time horizon. But awareness and solutions must begin now.
5. Solutions are possible to most of the problems. We know they work. Others areas need more studies, to identify solutions.
6. We must build awareness of the problems and the solutions.
7. We must solve the problems, if not now, then eventually. Now is easier and less costly. Crisis management of issues is not a cost effective way to solve problems, though it does certainly raise awareness of the problems.
8. We need help. Within our communities, and without. We must get many other involved.
9. We cannot wait for others to solve the problems for us. It will not work anyway, and there is not time. We need action now. We must be activists, evangelists: locally, nationally, and internationally. It is a universal problem.
10. This meeting is only a beginning. I look forward to the papers, to the individual discussions, and to future meetings as well. Most of all, I look forward to progress in combating the problems.

Thank you for coming.