ASTRONOMY EDUCATION AND THE AMERICAN ASTRONOMICAL SOCIETY

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It seems fair to say that the American Astronomical Society (AAS) — considering itself primarily as an organization of *research* astronomers — has had an ambivalent relationship with the world of astronomy education. While some members have felt that it was important for the Society to play an active role in this arena, many others looked upon educational work with disinterest and even disdain. Some officers of the Society occasionally advocated significantly greater AAS involvement in education, but the Council rarely followed up with the sustained political will or the resources needed to bring about effective change.

Our examination of Society records and publications shows that enthusiasm for astronomy education seems to have come in cycles — with periods of more concentrated activity alternating with stretches of unmourned inactivity. As summarized in Table 1, some education committee or task force would generally begin with great enthusiasm to reform or revive some aspects of education, only to fade away after a few years as its leaders became tired or felt that they did not have the support of the community. Then, often after a dormant period, a new generation of "reformers" would tackle the same issues (occasionally even using the same language and the same suggested solutions as their rallying cry), only to fall prey to the same problems or lack of support. And when Society leaders did take a more active interest in educational matters, it was often motivated (as it appears to be at the time we are writing this history) by concerns over jobs for astronomy graduates, and whether there were too few or too many astronomers to fill the positions then available to them.

Such ambivalence may be natural for a Society whose primary aim is encouraging research, but it also means that the kind of national coordination that has helped many of the research branches of astronomy become more effective has frequently been absent in the field of astronomy education. Despite many good educational initiatives from the AAS over the years, such lack of coordination continues to hamper efforts to improve astronomy education even today. We note that there has never been a journal or magazine devoted to astronomy education, and that some of the most important symposia in the field have been organized outside the aegis of the AAS (although they frequently obtained AAS co-sponsorship later for the prestige it afforded).

DEFINING ASTRONOMY EDUCATION

One crucial question, which was to emerge again and again in the relationship of the AAS and astronomy education, concerned what the term was to mean. To many astronomers, especially in the early years, astronomy education meant the training of

new astronomers. If any aspect of education was to place a consistent hold on their attention, it was the issue of how to produce world-class scientists at a time when sources of support for the training of scientists were still meager and intermittent.

Yet from time to time, the question would come up whether a broader scope for the Society's educational purview was not necessary. Should not the AAS also concern itself with what we today call "general education courses" in college, with K-12 education, and with public education (through the media, through planetaria and museums, and other ways of reaching a much broader segment of the American public)? We shall see that there has been a gradual expansion of the scope of the Society's educational efforts with time. There were several periods, especially in the 1950s and 1970s, where groups within the Society clearly advocated taking a broader view of the appropriate purview for the AAS and undertook projects to help those working in these larger domains. Nevertheless, this question still remains a vexing one for a Society with limited resources, and recent AAS committees and Councils continue to grapple with it.

Still, our history will end on a hopeful note, since as the AAS Centennial draws near, the Council has voted a specific dues increase dedicated to expanding the Society's programs in education and has hired (for the first time) a paid education coordinator to spearhead these efforts.

TABLE 1. *AAS Educational Committees and Groups.*

Name	Dates of Existence	What Happened To It?
Committee on Cooperation in the Teaching of Astronomy [changed to the Committee on the Teaching of Astronomy]	1911–1921	Abolished by Council (was inactive at end)
Teachers' Committee	1941–1956	Dissolved; Chair had resigned saying there was a stigma attached to the committee
Committee on Education in Astronomy	1957–1972	Dissolved after the TGEA was appointed
Task Group on Education in Astronomy (TGEA)	1972–1985	Education Officer took over many of its tasks
TGEA Advisory Board (soon becomes Education Advisory Board)	1975–1997	Replaced by Education Board
Working Group on Astronomy Education	1991–	
Ad Hoc Committee on Education	1993–1994	Evolved into the Education Policy Board
Education Policy Board	1994–1997	Replaced by Education Board
Education Board (combines the Education Policy Bd. & the Education Advisory Bd)	1997–	

THE EARLY DAYS

The birth of the AAS corresponded to a generally discouraging time in astronomy education in the U.S. A series of academic conferences arranged by a group of ten college presidents and high school principals, known as "the Committee of Ten," in the last decade of the nineteenth century — reflecting broad trends in educational reform — had recommended (among other things) that astronomy be eliminated as a required course for college admission, and that physics, chemistry, and biology be emphasized. As an elective course not required for college, what little astronomy was still offered soon suffered from lack of enrollments, and the subject eventually disappeared from the curricula of most high schools and thus from the preparation of most elementary school teachers as well.

As a result, between the years 1900 and 1915 astronomy suffered a "precipitous decline in high school and college."[1] The inertia from these early school reform efforts left both pre-college and college astronomy education for non-scientists in a state of disarray and impoverishment from which it did not really recover until the Sputnik era ushered in its wave of funding for expanded science training.

The first record we have of an education paper at an AAS meeting was of one given by Sarah F. Whiting of Wellesley College at the Society's fourth meeting, in December 1902. The paper is listed by title only: "Astronomical Laboratory Work for Large Classes."[2] She gave another education-related paper at the seventh meeting, but there is little record of other members following suit.

During the course of the twelfth meeting in August 1911, the Council appointed a Committee on Cooperation in the Teaching of Astronomy, chaired by C. L. Doolittle of the University of Pennsylvania. One of the committee's first tasks, in 1912, was to undertake a survey of the availability of astronomy courses at a range of colleges and universities.

The report of the survey began with an eloquent statement that seems as appropriate today as it was almost a century ago: "At its late meeting in Ottawa, [the Society] was mindful of the fact that the advancement of science depends not only on the discovery of new truth, but on the diffusion of knowledge, and the scientific spirit which creates a friendly atmosphere for its reception. The Society considered the deplorable ignorance of persons, otherwise intelligent, in regard to the everyday phenomena of the sky, and the fact that astronomy lags behind the other sciences in adopting the modern method of laboratory work by the student." The 80 replies received, the committee reported, were disheartening. "Only a very small proportion of college men and women know much about anything off this little planet."[3]

The committee asked for the assistance of the Society in devising constructive plans for improving the situation, but no further reports on this subject appear in the Society's publications and the committee was abolished (with a list of other inactive groups) at the 26th meeting in 1921.

In 1915, the AAS held its 18th meeting in San Francisco and Berkeley, in what was to be the first of several joint meetings with the Astronomical Society of the Pacific (ASP). The ASP had been founded ten years before the AAS as an outgrowth of the cooperation between professional and amateur astronomers during the eclipse of January 1, 1889. Despite its regional name and origins, it would grow to be a national

and international group, but it differed from the AAS in that it invited and accepted membership from everyone interested in astronomy and made public outreach a main concern from the outset.[4] In later years, a number of the AAS education projects would be undertaken in cooperation with the ASP.

A WARTIME REVIVAL

After the demise of the Committee on the Teaching of Astronomy (as it was known by 1921), astronomy education was absent from the published records of the AAS for almost two decades. However, this changed during World War II, when the need for trained "aerial navigators" made astronomy education a defense-related issue.

During the 66th AAS meeting in September 1941 at Yerkes, more than 70 teachers of college-level astronomy attended a Sunday afternoon conference and discussed a wide range of problems and techniques. On the agenda were the spelling and pronunciation of star and constellation names, finding appropriate laboratory materials and textbooks, the problems of switching from the old lantern slides to Kodak's new compact 2×2 design, and combating astrology (with a skeptical talk by Allen Hynek). Both the well-established *Popular Astronomy* and the new *The Sky* (which would later merge with *The Telescope*) expressed interest in publishing articles on the teaching of astronomy. An unofficial committee, chaired by J. H. Pitman of the Sproul Observatory, was appointed to continue the work of the group and plan future meetings.[5]

At the 67th meeting in December 1941, this Committee held three meetings and agreed that its "ultimate aim is to devise means for the encouragement of the teaching of astronomy in American Colleges and Universities, having in mind that its value lies, not only in its broad aspects of understanding the workings of the universe, but also in its cultural aspects."[6] This AAS meeting, by the way, was — it appears — the first to feature a public lecture. Harlow Shapley gave a talk at Cleveland's Severance Hall on "Galactic Explorations with Newer Telescopes."

At the 68th meeting, the Council formally accepted the group that had been operating for about a year and designated it as the AAS Teachers' Committee. The group organized sessions on astronomy education and the war effort at several meetings and sponsored talks and discussions on teaching navigation effectively. At the 69th meeting in December 1942, for example, they offered a symposium on "Science Courses in the War Effort" with several military instructors in attendance. Even after the war ended, "Teachers' Conferences" (where teacher meant college or university professors) were regular parts of AAS meetings. (And in the era before simultaneous sessions, this meant that the full meeting was "turned over" to the Teachers' Committee.)

The 72nd meeting in June 1944 featured a discussion on what sort of astronomy should be taught in the post-war liberal arts colleges. "Those actively engaged in teaching are evidently far from being perfectly agreed on just what should be emphasized and how it should be taught, but this is a healthy sign..."[7] Not much has changed in this respect in the intervening half century, we note! At the 80th meeting in 1948 there was again a broad discussion on the astronomy curriculum in American colleges and universities.

THE 1950s: THE ERA OF THE CEA

By the mid-1950s, however, much of the intensity of the war years was forgotten and the country settled into a more routine existence. The AAS resumed its strong focus on astronomical research and instrumentation. Freeman Miller, an active member of the Teachers' Committee between 1948 and 1954, recalls that he and Allan Hynek were often "fed up with lack of support by the Council [for the Teachers' Committee]." He remembers that they did "pry enough money from the Council to circulate a questionnaire to all astronomy departments, asking about their interests in education; possibly the response contributed to our feeling of lack of interest."[8] Between 1953 and 1956, committee members did write an occasional column called "Sky & Teacher" in *Sky & Telescope* magazine, however, to keep the astronomical community aware of educational projects and issues.

At the 92nd meeting, in April 1955, the Council was asked to pass a resolution in response to a National Science Foundation panel considering "the relation of astronomy to the general public." The resolution read in part:

> It is the opinion of the panel that astronomy does not fare as well in [this area] as many of its sister sciences, and that more attention should be given by professional astronomers to matters of inspiring future public and government understanding, interest in, and support of astronomy... . The Council of the Society, therefore, recognizes that a definite need exists for the dissemination to the public at large of accurate astronomical information, consistent with the dignity of the science; deplores that, in the past, some stigma appeared to be attached to such activities; and recommends that astronomers devote reasonable time and effort to the preparation of popular, non-technical articles and lectures on astronomy and closely allied topics.[9]

The problem the resolution referred to was dramatically illustrated just two meetings later, when the Chair of the Teachers' Committee, Carl Bauer of Penn State, resigned, saying that he had had trouble getting cooperation from members in setting up an educational session for the meeting. Bauer's words, as reported in the Council minutes, were that "it appeared as though these members felt that a certain stigma attaches to being asked to do something for the Teachers' Committee."[10] The Council expressed surprise and appointed a panel of former Teachers' Committee Chairs, headed by Helen Dodson of the University of Michigan, as an advisory committee on educational policy.

After hearing the report of the Dodson committee at their next session (the 95th meeting of the AAS in late 1956), the Council dissolved the Teachers' Committee and established a new Committee on Education in Astronomy (CEA), whose members would be appointed at the following meeting. It was during the same Council discussion, by the way, that the suggestion of what would eventually become the Shapley lectures was raised. The concept was borrowed from an NSF-sponsored program at the American Mathematical Society, and would involve visits from astronomers to smaller or less research-oriented colleges, often ones without active astronomy programs, to encourage the appreciation of astronomy by faculty, students, and the public. The AAS's project began in 1957 with the help of the NSF, and was first called the "Visiting Professors Program." Renamed in honor of Harlow Shapley after his death, it continues

today as one of the Society's most visible contributions to the public understanding of science.

The new CEA was appointed at the 97th AAS meeting in 1957, with Joseph M. Chamberlain (then of the Hayden Planetarium in New York City) as its chair. The original members included such well-known names as Otto Struve, Carl Seyfert, Stanley Wyatt, and William Liller. The first years of the CEA coincided with the time of Sputnik, the concern in the U.S. that the country was falling behind in science and technology, and the infusion of significant federal funds into both science and education. It was not surprising, therefore, that many of the Committee's first activities dealt with what by 1960 was being called "the national shortage of astronomers" and with projects most likely to encourage more young people to enter the field. As the times changed in the 1960s, the CEA would broaden its mission to focus more on astronomy teaching and outreach for non-scientists.

The CEA began a number of the education and outreach programs that AAS members today associate with the Society. Among these were the "Careers in Astronomy" Brochure, first written by Struve and Gibson Reaves, which remains to this day the Society's most widely circulated publication. (In the first year and a half after publication, some 12,000 copies were distributed.) Two college level films on astronomy were produced with NSF support. A Foreign Visiting Professor Program broadened the outlook of many American graduate students by bringing astronomers from other countries to work at universities in the U.S.

The CEA debated the need for a newsletter on astronomy education, but decided that it was not worth the time and expense that would be involved.[11] Instead, members from larger institutions were encouraged to invite members in smaller schools to colloquia and other activities and to foster better communications among Society members engaged in educational work in whatever way they could. The lack of effective communication among astronomy educators at all levels remains a problem to this day.

Thornton Page represented the AAS and the CEA on a Cooperative Committee at the American Association for the Advancement of Science (AAAS), the umbrella group of U.S. scientific societies, which was then making recommendations for the reform of high school science education. The Council minutes report that: "...through Dr. Page's efforts, astronomy is now listed separately in AAAS curriculum guides, rather than as a happenstance item under general science."[12] Where to fit in seems to be a perennial problem for astronomy; in the new National Science Standards promulgated in the 1990s, astronomy wound up mostly under the Earth Sciences instead of the Physical Science headings.

In 1960, the Council discussed at length a report by Captain Carl Christie of the U.S. Navy on the need for more people with astronomical training (not necessarily Ph.D.s) and referred its recommendations to the CEA. At the December 1960 Council meeting Chamberlain reviewed what could be done to implement the Christie report, but many of the suggestions proved to be controversial and expensive. For example, the Council declined CEA proposals to keep track of statistics on graduate and undergraduate enrollments in astronomy programs, to appoint education representatives in each department or observatory, and to set up national programs of scholarships and fellowships through the AAS.[13] One has to see the reluctance of the Council in the

right context however; this was a time when the work of the Society was done entirely by volunteers and any new tasks would fall on the shoulders of such volunteers or would require grants to be written by volunteers to NSF. Indeed, it was discussions like the one generated by the Christie report that led the Council around this time to explore the idea of a paid executive officer for the first time.

CONFERENCES AND WORKSHOPS

As part of the implementation of the Christie report, the CEA sought NSF funding for a conference on graduate education in astronomy, which was held in October 1962 at Indiana University. Organized by Chamberlain and a committee that included Donald Osterbrock, Lyman Spitzer, Jesse Greenstein, and Harold Weaver (all of them future officers of the Society), the conference brought together representative faculty and administrators from many institutions.[14] Participants discussed the goals of graduate education, the curricula needed to achieve these goals, and the problems of recruiting outstanding students for the field. As George Abell summarized the conference a few years later, "there was considerable disagreement about what the curriculum should be, and there wasn't even great agreement on what the goals should be."[15] However, departments learned a great deal about how other institutions operated, and some curricular changes were made at both the graduate and undergraduate level, especially as they related to the importance of a good background in physics to modern astronomical research. A similar set of conferences would be held by the AAS in 1996, but responding to an employment crisis of opposite direction—not too few astronomers but too few jobs.

In August 1969, at the 130th meeting, the CEA sponsored a conference on educational issues, the first such conference held as a regular part of an AAS meeting for well over a decade. After a keynote address by then CEA Chair Abell, six other speakers considered various aspects of astronomy education from the graduate to the K–12 level.[16]

In his eloquent review, Abell brought out a number of the issues facing those concerned about astronomy education in the late 1960s, including lack of training in modern astronomy among many community college, high school, and elementary school teachers, planetarium staff, reporters, and college graduates in general. He discussed the increasing growth of unskeptical belief in such pseudo-sciences as astrology, problems with the difficulty of some of the science reform curricula which had been devised in the 1960s, and student dissatisfaction with some of the features of the college education system (large lecture classes, memorization of facts as a prime standard for good grades, and the lack of relevance in the curriculum). He admonished his colleagues that, "if we do not turn our attention somehow to finding solutions [to these problems], we may find that science in general, and astronomy in particular, will suffer from a grave lack of support." These were prescient words, perhaps even more relevant in our own era of shrinking budgets and growing public expectations than they were in the turbulent 1960s.

Independently, Elske v. P. Smith and Don Wentzel (both of the University of Maryland) organized a workshop, one day after the same AAS meeting, on laboratory exercises in astronomy aimed at college non-science students.[17] To everyone's

surprise, the 90 attendees included not only the astronomers who had been teaching non-science students but also much of the leadership of the AAS.

In 1971, with the sponsorship of the AAS and the N.Y. Academy of Sciences, Richard Berendzen, then of Boston University, organized a major conference on "Education in and History of Modern Astronomy" at the American Museum of Natural History. There were sessions on many aspects of education, from graduate training to planetarium shows, in the U.S. and abroad. The published proceedings of this conference stand as perhaps the best summary we have of the state of astronomy education in the 1960s.[18]

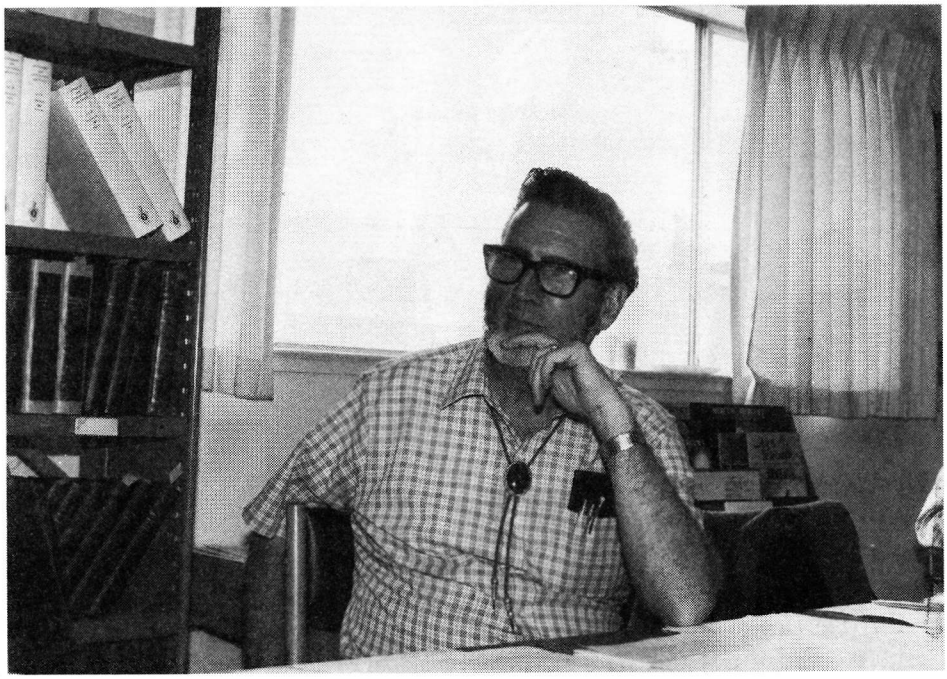

Figure 1. George Abell in 1982. Photograph by A. Fraknoi.

Abell was again the lead speaker, and expressed his vision of the most urgent need in astronomy education: "Far more serious today is the problem of selling astronomy to the public at large. Ultimately, the support of our science rests on the public's willingness to pay our salaries... . In the past, we have tended to leave it to others to carry the message of astronomy to the outside world, but now, as the public becomes increasingly disillusioned with science and concerned over increasing taxes...astronomy in the U.S. is losing support. Consequently, we have a responsibility to concern ourselves deeply with the problem of representing astronomy honestly and accurately to the public, and, hopefully, to gain appreciation and support for it."[19]

By the early 1970s, there was an additional impetus for astronomers to become involved with education: the employment picture in astronomy had swung to the opposite pole from the early 1960s. Now graduates of astronomy programs were having trouble finding research-oriented jobs, although positions in education were somewhat more numerous. During a discussion of the status of the AAS Placement Service by Executive Officer Hank Gurin at the 135th AAS meeting in Amherst, in

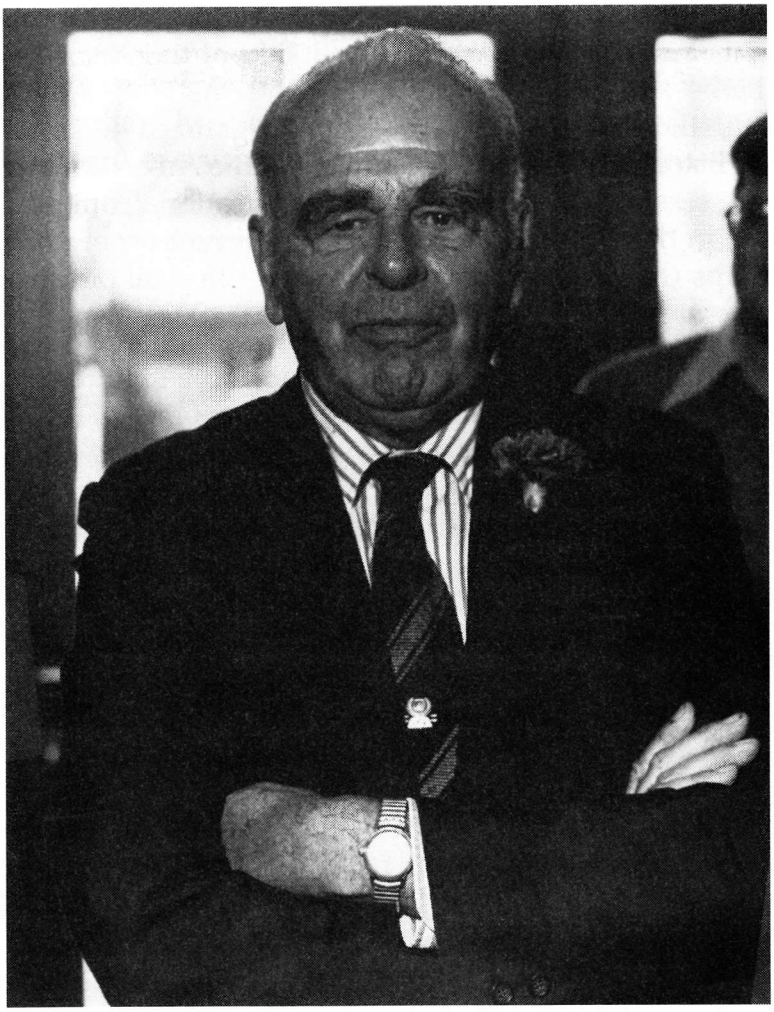

Figure 2. Bart J. Bok, circa 1978, was president of the AAS from 1972 to 1974, and at that time chaired the AAS "Aims Committee" on manpower to assess the needs of the profession. Photograph courtesy Bart Bok, DeVorkin collection.

August 1971, Bart Bok, one of the Society Vice-Presidents, rose to discuss at length the problem of unemployment among Ph.D. astronomers. He suggested that President Martin Schwarzschild appoint a committee to look into the matter, and found himself duly designated chair of an *ad hoc* "Committee on Manpower and Employment in Astronomy" along with Abell, D. van Blerkom, Don Goldsmith and John Trasco. Schwarzschild asked them to provide an interim report at the next AAS meeting. Included among the Committee's recommendations as reported at the San Juan meeting in December 1971, were the following suggestions:

> "Astronomy granting degree institutions should be encouraged to prepare their prospective graduates for careers in teaching, in which many of them will find themselves.
>
> We must help our Ph.D.'s and MA's...to develop ways in which they can apply for astronomically-oriented positions outside traditional colleges, universities, government laboratories and observatories... . [They especially emphasized educational positions in

> smaller and junior colleges, planetaria, computer science, the Peace Corps, and even high school.]
>
> Students beginning graduate work in astronomy should be given as honest an evaluation of the job market as possible before they begin their graduate studies.
>
> The community should not enlarge and may even want to cut back on the production of Ph.D. astronomers. The Heads of Astronomy Departments should be urged to begin thinking in terms of limiting the sizes of their graduate schools.
>
> This seems like a time in which we should urge the lower one third of each graduate group to terminate their graduate training with the Master's degree."[20]

It was a strong set of recommendations and represented a challenge to the larger departments of astronomy that boasted large graduate student populations. The Bok "Aims Committee" recommendations reverberated through the Society, but ultimately they were not widely put into effect, although a number of departments at the time did try to expand the placement of their graduates to non-traditional jobs, and a few tried to limit enrollment. Eventually, new instruments and increases in federal funding improved the employment situation, although the issues would return in the 1990s, as we shall see.

THE TASK GROUP ON EDUCATION IN ASTRONOMY

The late 1960s and early 1970s were an era of expanding popular interest in astronomy and the space program. The number of non-majors' college astronomy courses (and the number of students taking such courses) had begun to grow. New textbooks were being written and many popular-level books on astronomy attracted superb reviews in the mainstream media. Sensing the opportunities and challenges of this new era, the Board of the Astronomical Society of the Pacific began its new popular-level magazine *Mercury* in 1972 and hired its first executive officer, whose responsibilities included increased emphasis on public outreach. The kind of leadership that would be needed to turn the attention of the members of the CEA toward this larger arena, however, was not forthcoming; a new, more effective and pluralistic structure was needed for the AAS.

Martin Schwarzschild, Don Wentzel, and Gerrit Verschuur (NRAO) worked out the principles of a new organization within the AAS, the "Task Group on Education in Astronomy" (TGEA), and obtained approval by the Council at the summer meeting in 1972. Unlike the CEA, which was a small group appointed by the Council, the TGEA was open to anyone who wanted to become active in the realm of astronomy education and outreach. Wentzel and Verschuur were named the first coordinators of the TGEA for a three-year term. They obtained a three-year grant from the Program on the Public Understanding of Science at NSF's Educational Programs Division and enjoyed the active support of the key officers of the AAS in their endeavors.

It was clear that if the TGEA's work were to have a significant national effect, it would depend not only on the small number of astronomers who did not see themselves as primarily research astronomers, but also on cooperation with other scientific societies and groups. After all, many departments of astronomy at research institutions

did not consider educational work beyond the regular college courses as an activity that would further an astronomer's career; at least two of the original members of the TGEA were told this quite explicitly by senior colleagues. This was a time when Carl Sagan's public activities (years before the *Cosmos* television series) were regarded skeptically by many astronomers and sometimes condemned as oversimplifying astronomy. Among those who became active in the TGEA were astronomers at museums and planetaria, as well as those teaching at institutions where research was not required.

Table 2 lists some of the projects undertaken by the TGEA, both under the initial leadership of Wentzel and Verschuur, and when Paul Knappenberger, of the Science Museum of Virginia, took over their position three years later. Note that many of these projects were initiated or undertaken by other organizations or institutions, but

TABLE 2. *Some TGEA Projects 1972–1979.*

Project	Leaders
Astronomy in the National Parks (sky interpretation workshops and materials for park rangers)	Von Del Chamberlain
Traveling Exhibit on Cosmology for Planetaria	Frank Jettner, Charles Smith
Four Brochures for High School Students on Topics at the Forefront of Astronomical Research	Gerrit Verschuur Paul Knappenberger
A Pilot Program of Radio Spots on Astronomical Developments (begun in Virginia)	Charles Smith, Paul Knappenberger,
Listings of Astronomy Education Resources (began before TGEA)	Richard Berendzen, David DeVorkin
Annotated List of Astronomy Lab Activities	Haym Kruglak
A Collection of Introductory Astronomy Course Syllabi	James Wertz
Workshops on Effective Astronomy Teaching and Student Reasoning Ability (which resulted in a published workbook)	Dennis Schatz, Andrew Fraknoi, R. Robert Robbins, Charles Smith, Paul Knappenberger
TGEA Newsletter (with eventual circulation of 560)	Don Wentzel, Gerrit Vershuur
Collections of Astronomy Activities for the Classroom	Dennis Sunal
Syndicated Newspaper Column on Astronomy (ASP & AAS)	Andrew Fraknoi
The Bok Prize for Outstanding High School Projects in Astronomy (begun by Boston U. and later taken over by the TGEA and ASP)	Michael Papagiannis
AAS Booth at Meetings of the National Science Teachers' Association	William Straka
Coordination with Other Organizations, including the American Association of Physics Teachers, American Chemical Society, AAAS, ASP, etc.	TGEA Members

received encouragement, funding, support, or prestige through the involvement of the AAS. TGEA reports appeared each year from 1972 through 1983 in the *BAAS*, and can be consulted by those who want more information on these projects.

One of the most innovative of the TGEA-sponsored programs was organized by Von Del Chamberlain (then from the Abrams Planetarium, later with the National Air and Space Museum), to help rangers in the National Parks give evening "sky interpretation" programs. With NSF support, regional workshops were held in Tucson and at the Goddard Space Flight Center, and four issues of a handbook full of activities and resources were published and distributed. Numerous astronomers visited parks as part of the program and provided sky interpretation and astronomy talks for both the park staff and the public. Even years later, astronomers volunteering to give a talk at one of the parks found the park management and rangers eager to use the opportunity. Upon Chamberlain's move to Hansen Planetarium, the program continued there at a reduced level.

PROGRAMS FOR TEACHERS AT MANY LEVELS

The TGEA's activities regarding college teaching were largely aimed at AAS members. A special TGEA session was held at the AAS meeting in August 1974 and included a panel discussion on how to train graduate students so that they would be ready to teach in small colleges. More and more Ph.D. astronomers were now taking positions in small colleges and committing themselves to heavier teaching loads than faculty at research universities. In recognition of the value of their contribution, these teaching astronomers have been awarded a significant fraction of the AAS Small Research Grants, which give priority to smaller, less well-endowed institutions. Thus the Society has aided such faculty in keeping their research going despite the heavy teaching demands on them.

By this time, papers at AAS meetings were divided into subject categories, with education relegated to "Other Topics." Starting in 1974, education was made a separate abstract category. The first contributed papers session devoted to education attracted 11 papers in August 1974 and anywhere from 5 to 12 papers during the next five summer meetings of the AAS. Summer meetings were emphasized since members whose primary interest was in teaching could more easily attend these meetings. Several specialized programs of invited talks were organized in 1977 and 1978, and such invited and contributed sessions have continued at AAS meetings ever since, with the number of sessions and papers rising and falling with the interest level of the local organizing committees, the priorities of the Society vice presidents, and the persuasiveness of the succeeding education committees and groups.

One of the most far-reaching initiatives of the TGEA was to begin programs to assist astronomy teachers at community colleges and high schools to improve their curricula. This was the time when science educators were discovering the work of psychologist Jean Piaget and others concerning the stages through which the reasoning level of students progress (and the importance of using hands-on activities when planning instruction at all levels.) A TGEA session at the June 1976 AAS meeting led to a plan of conducting and publishing a workshop on effective teaching strategies for introductory astronomy. Dennis Schatz, then of the Lawrence Hall of Science at the

University of California, Berkeley, obtained NSF support for this project. Two workshops were offered (in 1977 and 1978) and the materials from them were judged to be sufficiently useful to warrant wider dissemination.

The publication that resulted, *Effective Astronomy Teaching and Student Reasoning Ability* by Dennis Schatz, Andrew Fraknoi, Robert Robbins, and Charles Smith (1978, Lawrence Hall of Science), was distributed to instructors around the country and became quite influential in the small world of astronomy education. Much of the later work in developing effective astronomy activities in such programs as Project STAR at the Harvard-Smithsonian Center for Astrophysics and Project ASTRO at the ASP drew inspiration from this pioneering work.

Two of the leaders of this first workshop, Schatz and Fraknoi (then of Cañada College and later of the ASP) went on to lead a series of workshops specifically for teachers in grades 3–12 around the country, mostly through the ASP but for other organizations as well (including the IAU and National Science Teachers Association). These workshops, now called "*The Universe in the Classroom*," are still continuing at ASP meetings today. When the AAS later introduced its own workshops for high school teachers, called "Astronomer for a Day," the synergy continued with many of the materials and quite a few of the speakers coming from the ASP's workshops and publications.

Later, in 1984, the ASP and the AAS began a joint project to publish a newsletter on astronomy for teachers in grades 3–12, also called *The Universe in the Classroom* and edited by Fraknoi, but written with the help of many members of both Societies. Word about the free newsletter spread quickly and within a little more than a year, more than 10,000 requests for subscriptions had come in from around the U.S. and Canada.

Figure 3. Joseph M. Chamberlain receiving the Klumpke-Roberts Award of the ASP, 1988. Photograph by A. Fraknoi.

Scrambling to obtain the resources needed to meet the unexpectedly large demand, the ASP and AAS received support from the Canadian Astronomical Society, the International Planetarium Society, the Slipher Fund of the National Academy of Science, and several other groups. This newsletter is still being published, and is now translated into more than a dozen languages around the world (and then distributed locally).

THE AAS PRESS AND EDUCATION OFFICERS

During the first six years of the TGEA, astronomy education became a more "respectable" activity for professional astronomers. The TGEA certainly benefited from the change in astronomers' outlook, especially as the employment picture required a sober look at alternative job possibilities. At the same time, the TGEA contributed to this change, primarily by giving a new venue and visibility to those astronomers who, instead of or in addition to their research work, preferred to expand into educational spheres.

In 1975, when the TGEA's first charter needed to be renewed, the Council appointed a TGEA Advisory Committee, made up of more senior members of the Society and chaired by Owen Gingerich of Harvard. This advisory group eventually took on a life of its own, quite separate from the TGEA, and became known in the 1980s as the Education Advisory Board.

Encouraged by the work of the TGEA and feeling the need to relieve the Executive Officer of some of the work involved with educational activities as the office moved to Washington, the Council — at the recommendation of the TGEA Advisory Committee — in 1979 created the position of Education Officer, designed to be an

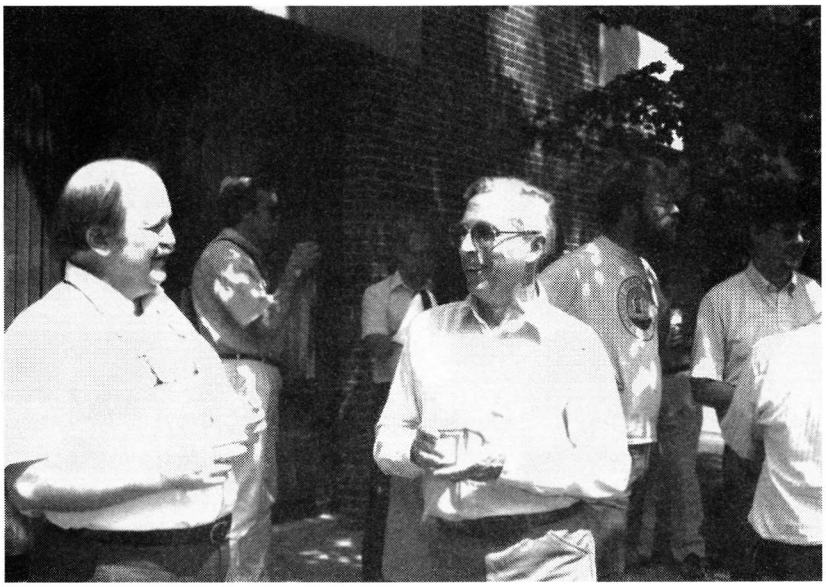

Figure 4. (left-to-right) Charlie Tolbert and Donat Wentzel at the 1988 IAU Symposium on the Teaching of Astronomy. Larry Marschall is standing directly behind Wentzel. Photograph by A. Fraknoi.

ex officio member of the Council. This new AAS Officer would serve as press liaison, coordinate the work of the TGEA, and oversee the other ongoing educational programs of the Society, such as the Shapley lectures and responding to public inquiries. Secretarial support would be provided, but there would be no salary for the person in the position.

Subsumed in the new position was the work of AAS Public Information Representative (PIR), which had been created in 1973 in response to one of the recommendations of the Bok Committee Report of 1971. At the urging of the TGEA, the Council instituted the office, (later changed to Press Officer) whose duties were to reach out to the news media. Of all the innovations during the TGEA era, this was probably the most effective one in the long run. The first PIR, appointed in 1973, was Kenneth L. Franklin of the Hayden Planetarium, briefly joined by William J. Kaufmann of the Griffith Observatory. They began to invite reporters to AAS meetings, to issue press releases for them about newsworthy work being discussed, and to arrange interviews with scientists during the course of the meeting.

The job was eventually combined with the work of the new Education Officer in 1979 and taken on by Harry Shipman, of the University of Delaware, but by 1984 it was clear that the two volunteer jobs really needed separate individuals. Steve Maran of NASA's Goddard Space Flight Center has held the post ever since, becoming over the years one of the most effective disseminators of science information to the media in the country. Largely as a result of his efforts, the AAS is now widely held up by reporters as a model for how scientific societies should conduct their meetings to be of maximum utility to the media. (See chapter on the Press Office, page 213.)

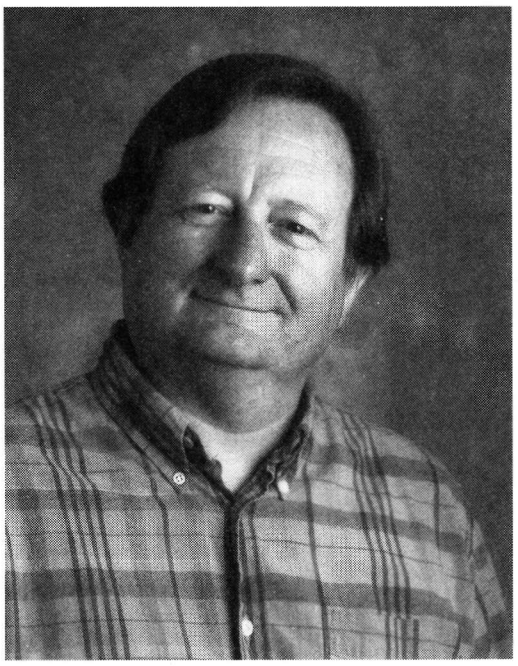

Figure 5. Left: Andrew Fraknoi in the mid-1980s. ASP Archives. Right: Harry Shipman in the early-1990s. University of Delaware photo by Jack Buxbaum.

During Shipman's six year tour of duty as both education and public information coordinator for the Society, the TGEA was still active, although in the 1980s its separate identity began to slip away as more and more of the AAS education program became consolidated in the Education Office. Regular reports of the Education Officer appear in the *Bulletin of the AAS* and, later, in the *AAS Newsletter*.

In 1985, Charles Tolbert of the University of Virginia replaced Shipman. It was under Tolbert's administration, in January 1988, that the AAS offered its first "Astronomer for a Day" workshop for high school science teachers. During the first workshop (in Austin), 60 Texas teachers participated in what was billed as "a research science meeting, but at a level that the teachers could understand. Some of what they heard was interesting, some esoteric, some exciting, and some dull (just like a real AAS session)."[21] In later years, the talks by research astronomers would be supplemented with talks and sessions by astronomy educators, and the teachers would be encouraged to attend some of the AAS sessions themselves.

Inspired by the success of the Education Officer concept for the AAS, the Division for Planetary Science appointed its own Education Officer, Martha Hanner of JPL, in 1990. Since then, Linda French of Wheelock College, and Larry Lebofsky of the University of Arizona have held the post. In 1991, the Education Advisory Board formed a Working Group on Astronomy Education. The existence of such a group would allow AAS members to present an education paper as well as a research paper at the same Society meeting and would provide those members interested in education with a group identity within the AAS. So far, the Working Group, headed by Stephen Shawl of the University of Kansas, has sponsored a number of sessions at AAS meetings and an electronic newsmail service on education issues (which is currently distributed to about 300 people, and can be consulted on the World Wide Web as well.)

THE "BENEFITS TO THE NATION" ERA

As the national budget deficits built up during the 1980s, the feeling of expansion and optimism that (rightly or wrongly) characterized much of that decade began to change into a concern for what would happen when the bills for all that spending would become due. As the 1990s began, astronomy, like many other fields, began to sense Congressional reluctance to fund many domestic programs and the increasing demand that programs that were funded demonstrate their relevance to immediate national concerns. As the 1990s wore on, permanent positions for astronomers again became more difficult to obtain.

For several decades, the astronomical community had organized a "decadal survey" of the needs of the profession, presenting its research priorities in a united front to the federal funding agencies. The most recent such survey, looking forward to the 1990s, chaired by John Bahcall of the Institute for Advanced Study, included a special panel on astronomy's "benefits to the nation," with education assuming a significant role in its report.[22] Astronomers may not be able to cure diseases, solve the energy crisis, or make the country more competitive with Asian economies, but, the report pointed out, the excitement of our exploration of the cosmos was a powerful tool in helping the nation's youngsters appreciate the value and effectiveness of the scientific method (and thus in helping to train a more technologically literate work force).

Many astronomers began to see that a modestly increased emphasis on astronomy education could be a politically and socially valuable step for the community to take. And, as in the 1970s, the education sector continued to be a source of employment for graduates of astronomy programs who could not obtain research positions. Several candidates for AAS offices ran and won on platforms of increased attention to education.

Among the suggestions of the Bahcall survey report was that the AAS might consider instituting a prize for education (in addition to the various prizes it gave for research). As it happened, Bahcall was elected President of the AAS from 1990 to 1992 and after sharing a taxi with the President of the Annenberg Foundation, took steps to create the Annenberg Foundation Award, funded by the Foundation on a five-year trial basis, to recognize achievement by an astronomer in the field of education and public outreach. The rules for the prize were recommended to the Council by the Education Advisory Board, and the first winner, in 1992, was, appropriately, Carl Sagan. Unlike the other AAS awards, this prize did not require its recipient to give an invited talk at an AAS meeting. Still a way was found for each of the winners to speak at the meeting where the Prize was awarded.

During the five years that the award was funded, however, the Annenberg Foundation changed presidents and priorities, and after the fifth award, there was no funding to continue the program and no active plan at the AAS to seek funding elsewhere. As we write this history, the award has been suspended indefinitely. One has to wonder whether the AAS Council would have accepted a new *research* prize without a permanent endowment or allowed it to disappear without involving more of the membership in efforts to find alternate funding?

In 1991, Mary Kay Hemenway of the University of Texas became the third AAS Education Officer and began to expand the activities of the Education Office significantly. She became active in a number of science education organizations, including the newly formed umbrella group called the Coalition for Earth Science Education. In 1992, the Society received funding from NSF for the supervision of the national program of "Astronomy Research Experiences for Undergraduates." Plans were also made to apply for a substantial NSF grant to fund a national program of secondary-school "Teacher Resource Agents" in astronomy, modeled on a successful program in physics run by the American Association of Physics Teachers. This grant was received by the AAS and an extensive program of teacher training was undertaken between 1994 and 1996.

At the meeting of the Council in June 1993, Hemenway set off a fire-storm of discussion by requesting one-quarter time salary support for her work as Education Officer. She was existing on soft money at her own institution, but there was also a sense that the level of activity in the Education Office was significantly greater than a volunteer should be asked to supervise. In response, President Sidney Wolff (NOAO) formed an *ad hoc* committee, chaired by Council member Suzan Edwards of Smith College, to review education policy and operations within the AAS and recommend how the Council should deal with Hemenway's precedent-setting request.

THE EDUCATION POLICY BOARD

After vigorous discussion about the issues and the role the AAS should take in astronomy education, the Edwards Committee made its final report to the Council in June 1994. Their recommendations went much further than Hemenway's simple request. They advocated that the Society should have a full-time paid Education Officer, together with an Education Policy Board that would function as the equivalent of the Society's Publications Board in the arena of education and public outreach. The Society had to take a "leadership role" in developing an education strategy for American astronomers "in order to maximize their contributions to enhancing the nation's literacy...and productivity in science." Furthermore,

> The AAS must also provide a framework and resource network to encourage and enable its members to become active and effective participants in furthering science education. Moreover, we need to ensure that these efforts ... engage the energies of the research community of astronomers. Not only can researchers expect to be increasingly called upon to justify how their efforts benefit society, but without the involvement of those who are at the forefront of acquiring new knowledge about the universe, the unhealthy separation of researchers from educators will remain a possible outcome.[23]

The new AAS President Frank Shu responded by appointing an "*Ad Hoc* Committee on Educational Policy," chaired by Edwards and Stephen Strom of the University of Massachusetts, to consider the broad policy implications of the Edwards Committee recommendations, what was happening in science education at the national level, and what ways might be found to expand the AAS education effort in the context of these national changes. The new Committee, which soon became known as the Education Policy Board, began by considering the state of astronomy education and opportunities for AAS leadership at all levels (graduate, undergraduate, K–12, and public outreach.) It drafted, with some encouragement from the NSF, a broad proposal for an "Education Initiative in Astronomy."

At its January 1995 meeting, the Council (after much debate) approved a $10 increase in Society dues specifically earmarked to support education and public outreach activities. There were several arguments in favor of such a move: In an earlier survey of the AAS membership, increased work in education had been the only area for which a majority of members was willing to pay greater dues. And to fund an expensive education initiative, NSF would surely ask the AAS to shoulder a reasonable share of the costs. (With about 5,000 members, a $10 dues increase would still only generate about $50,000, not a lot of money considering the work that needed to be done; certainly not enough to fund a full-time, senior level Education Officer with appropriate travel funds and support staff.)

In the summer of 1995, however, the AAS was told that the Policy Board's ambitious NSF grant would not be funded and everyone had to go back to the drawing board. By late 1995, the Education Policy Board scaled down its proposal to focus solely on graduate education in astronomy, and soon received NSF funding for a series of meetings, discussions, and a report on this subject. These occurred throughout 1996 and many of the ideas suggested in earlier AAS reports (such as the Bok report of 1971) resurfaced independently. A final report is being submitted to the Council in summer of 1997, as we write.

In the meantime, in 1996, the Council approved a new structure for the AAS education effort. The older Education Advisory Board and the more recent Education Policy Board would be merged into a single Education Board, headed by an elected volunteer Education Officer. Bruce Partridge of Haverford College assumed this role in 1997 and his group is charged with continuing some of the policy initiatives and community-wide discussions of the Policy Board. In addition, the Society has hired a half-time paid Education Coordinator (Douglas Duncan of the University of Chicago) who will begin an active campaign to expand the educational activities of the Society in many areas. With a budget from the AAS limited essentially to the funds generated by the $10 dues increase, Duncan will search for funds elsewhere and leverage the efforts of other institutions and organizations, much as the TGEA did in the 1970s.

Is the current effort for more educational involvement by the AAS simply another crest in a wave of interest in education, which will subside as time goes on? Or will the reality of a paid education staff member make a permanent institutional difference for education at the Society? We leave this question for future historians to ponder, noting only that the challenges facing our Society (and our society) at all levels of education remain formidable and worthy of our best efforts.