

DIVISION J
COMMISSION 21

**GALACTIC AND EXTRAGALACTIC
BACKGROUND RADIATION**
RAYONNEMENT DU FONDS DIFFUS
GALACTIQUE ET EXTRAGALACTIQUE

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HISTORY AND HIGHLIGHTS (1955 - 2015)

1. History

Commission 21 was one of the oldest and smallest in the IAU yet one which underwent the most evolution since its inception. It began in 1955 as *Light of the Night Sky (Lumière du Ciel Nocturne)* under the Presidentship of Jean Dufay (University Observatory at Lyon). As the name suggested, in the years before space observations, its focus was on observations of atmospheric light which, at the time, was the domain of astronomers. Thus the early proceedings of the Commission were dominated by reports of the daytime and nighttime emission as observed from different locations and different conditions. Our knowledge of the Earth's atmosphere is still shaped by these early observations (Meier R.R., 1991, *Space Sci. Rev.* 58, 1). Members of Commission 21 were key to organizing interational collaborations to set up atmospheric stations at different latitudes, including in the Souther hemisphere and in ensuring a consistent calibration between the instruments. The Commission also bought in results from Soviet scientists in an era where communication was limited by both politics and language.

By the late 1960s, space-based observations were yielding valuable information about the airglow at high altitudes as well as opening up new wavelength regions, such as the ultraviolet where many of the important line transitions lie. Zodiacal light observations began to play a larger role in observations of the diffuse sky at this time and when M. Huruhata summarized the triennium ending in 1969, he included one section (out of 15) on observations of the zodiacal light and only briefly mentioned the first observations of diffuse light from the Galaxy.

The next few years were marked by a rapid change in focus from atmospheric emissions to observations of the zodiacal light and then to the diffuse Galactic and extragalactic light. Much of this was due to the movement of atmospheric studies from astronomy to space physics and geophysics and the introduction into the field of a new set of astronomers studying the diffuse sky in wavelengths from the X-ray through the infrared with several strong groups in the ultraviolet. This was reflected in the next several proceedings where H. Elsasser gave equal importance to the zodiacal light and the airglow

with an entire section dedicated to the diffuse Galactic light and part of another to the extragalactic light. The shift was complete by the next report by J. L. Weinberg where atmospheric studies were explicitly excluded. This was also the first meeting with a preponderance of space-based data including observations in the ultraviolet (UV) and the infrared (IR). As observations from outside the Earth's atmosphere became, if not common, at least not unusual, the faint solar and extra-solar diffuse emission acquired greater interest and the natural place for those astronomers interested in diffuse emission was in Commission 21.

H. Tanabe encapsulated the new philosophy of the Commission in his triennial report when he stated that "The light of the night sky includes several components which spread all over the celestial sphere. These light components are terrestrial (airglow), interplanetary (zodiacal light), galactic (integrated starlight, diffuse galactic light) and extragalactic (extragalactic background light). Thus the study of nature of each light source, covering large distance, is pursued in different fields of astronomy. However, the techniques of measurement for respective components are similar and the knowledge of other lights is indispensable even in the study of a particular component."

The next few years highlighted the importance of UV observations of the diffuse Galactic light with hints of the extragalactic emission but, even more so, the advent of the all-sky IR observations with the *Infrared Astronomy Satellite (IRAS)* and the *Cosmic Orbiting Background Explorer COBE*. This period also saw the shift in focus to extragalactic observations and work on the CMB, particularly in the infrared. Many of the new workers in the field were not from traditional astronomy and were not members of the Commission or of the IAU, itself. This led to a crisis in the Commission's functioning as the IAU proposed that Commission 21 be merged with Commission 22 (*Meteors, Meteorites, and Interplanetary Dust*). However, the primary scientific interests for Commission 21 had been, for several decades, diffuse emission from our Galaxy and from the extragalactic sky and not from Solar System sources. Although the zodiacal light is a major contributor to the diffuse light in both the IR and the UV, the Commission's interest in it for empirical rather than fundamental. The Commission therefore petitioned the IAU for a new home and found it in Division VIII (Optical and Infrared Techniques) with the new name of *Galactic and Extragalactic Backgrounds*. It remained there until the recent reorganization within the IAU.

2. Scientific Output

Over its long history, Commission 21 has sponsored or cosponsored many Symposia and Colloquia of which the most important was a Symposium on *Galactic and Extragalactic Backgrounds* held in Heidelberg in 1989. A number of presentations were made on the diffuse light in many wavelengths including observations from the edge of the Solar System from Pioneer, UV observations from a number of rocket flights as well as observations made from the *Space Shuttle*, new views of interstellar dust from *IRAS* and sub-mm observations from balloons in the pre-COBE era. Leinert *et al.* (1998 *Astr. Ap. Supplement Series*, 127, 1) compiled all the knowledge of the *Light of the Night Sky* in all wavelengths and from all sources into one reference paper which has been used heavily by astronomers from all fields.

3. The Future

The advent of wide area surveys has brought new interest into the field of diffuse radiation. Some part of this is the technical reason that the background can prove to be the

limiting factor in large field observations due simply to its integration over the large field of view. However, much of it is because of the intrinsic scientific importance of the diffuse background. New insights into the dust properties are coming from the IR observations from Planck and Herschel and GALEX has mapped the UV background over the entire sky. It remains to be seen how these will develop within the context of the IAU, whether wavelength specific groups will grow or one overarching group.

Jayant Murthy
President of the Commission