Monday, July 1, 2019

The Cosmic view : writings in Art and Science - Gallery walk.

Where does humanity fit in the cosmos?

Albert Einstein, one of history's towering scientific geniuses, explores this fascinating subject, he loved to photograph and most of photographs were taken by NASA's Hubble space telescope.

Science exists for Science’s sake, like Art for Art’s sake, and does not go in for special pleading for the demonstration of absurdities.

Never forget that the fruit of our labor does not constitute an end in itself.

Economic production should make life possible, beautiful, and noble.

We must not permit ourselves to be degraded into mere slaves of production.

Part of my artwork in preparation "Magneteevee" and it's linked to many writings and works from previous magazines.

Looking at the xx years history of observations of active galaxies, it is clear that the definition of what they are has strongly influenced the methods of finding them.

From our present perspective, many of the techniques used over the past xx years are not truly appropriate .

In this chapter, It will be used the words Active Galactic Nuclei (alias AGN or quasars) to be the equivalent of radiating supermassive black holes, even though this perspective is very recent.

The difficulty in finding AGN is defining what makes the observed radiation different from that due to other processes, in particular those related to normal stars and stellar evolution (supernovae)

This has often been a process of exclusion: that is, the emission does not resemble that from stars or stellar processes.

Dust, high-luminosity emission from starbursts, and the possible effects of unusual types of stars complicate the issue.

The strong effects of observing in different spectral ranges also need to be taken into account.

Finally, it is clear that the non-stellar signature has a wide variety of forms that gives rise to the "zoo" of names for active galaxies.

The spectral energy distributions, optical emission-line properties (strengths, widths, and nature), line of sight column densities, time variability characteristics, and bolometric luminosities of Seyfert 1 galaxies, Seyfert 2 galaxies, BL Lacertae objects, LINERs (Low-Ionization Nuclear Emission Regions) and quasars (to use the names of the largest samples of objects) are all rather different.

It has taken many years and a large amount of effort to finally come to the realization that all these classes are manifestations of the same underlying physical process: emission from near to a supermassive black hole.

However, even today it is not certain if all of these sources are driven solely by accretion, or whether there is also energy extraction from the spin of the black hole.

It is also not clear if the energy production is dominated by radiation, relativistic particle production, or bulk motion of material.

It is entirely possible that there is a simple relation between the names of the sources and their physical natures, but at present this seems very complex and not unique.

As opposed to stellar classifications, there is not a one-to-one relationship between the class of the object and its physical nature.

However, there are some clear distinctions.

The first sample of non-stellar activity was that of Seyfert in 1943, who found a wide variety of strong broad lines in the nuclei, but, not elsewhere of several otherwise normal galaxies.

It was clear from this early paper that there was something quite unusual about these sources and that they must be fairly common, but it took almost 20 more years for significant progress to be made.

By definition, emission from a black hole does not resemble that from an ensemble of normal stars.

It has a different broadband spectral shape (the Spectral Energy Distribution or SED) a very high-luminosity density, and very different time variability properties.

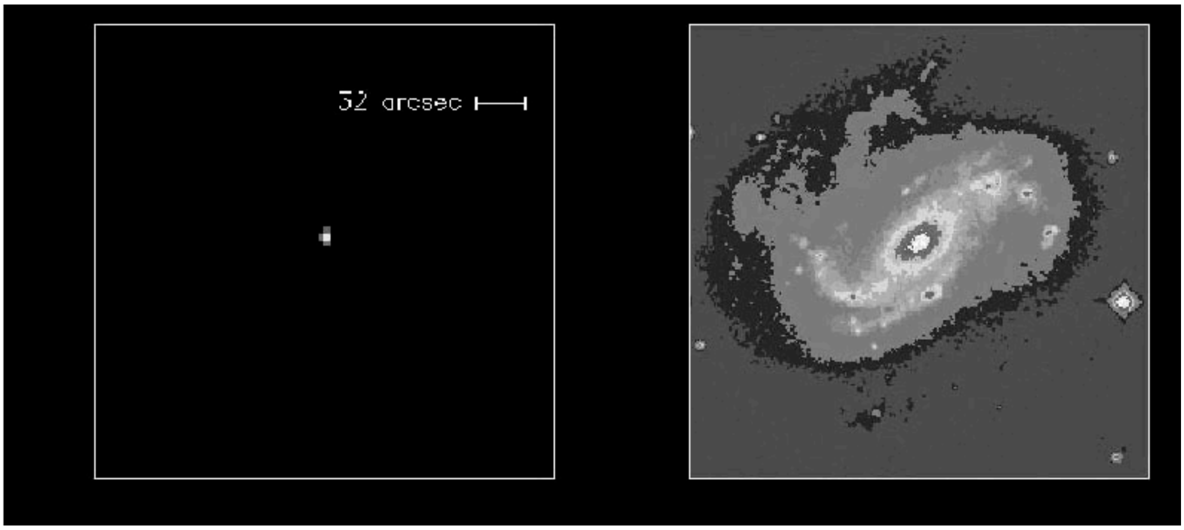
Roughly speaking, the broadband spectrum of an optically-selected AGN can be represented by a power law with roughly equal energy per decade.

This is much broader than the ensemble of spectra from stars, which is roughly the sum of blackbodies with an effective temperature.

Superimposed on this power-law form are strong optical and UV lines from hydrogen, highly ionized C, N, and O, and a complex of low-ionization Fe lines.

Thus, selecting sources on the basis of either their similarity to an AGN SED or their difference from a stellar SED is rather productive.

While the SED for optically-selected AGN is well studied, that for radio, infrared (IR), and X-ray-selected sources is much less well documented. Many of the radio-selected and hard X-ray-selected AGN show no indications of non-stellar colors in ground-based UV-optical-IR observations, and, thus, the use of the SED in these bands as an AGN indicator will not find the objects.



(Left panel) X-ray (ROSAT High-Resolution Imager) and (Right panel) optical (SDSS) images of the nearby Seyfert galaxy.

Notice in the X-ray image that essentially the only observed emission is due to the AGN, while the optical image is dominated by starlight.

This is one of the original objects identified by Seyfert (1943)

Recall:

The first meaning of the word STAR is that of a luminous point in the night sky, and by extension, geometric figures representing rays starting from a center (see the symbol of the star)

In astronomy, the more restricted scientific significance of a star is that of a celestial plasma body that radiates its own light through nuclear fusion reactions, or bodies that have been in this state at a stage of their life cycle, such as white dwarfs or neutron stars.

This means that they must have a minimum mass so that the conditions of temperature and pressure within the central region (the heart) allow the initiation and maintenance of these nuclear reactions, threshold below which we speak of objects substellar.

The possible masses of stars range from 0.085 solar mass to a hundred solar masses.

Mass determines the temperature and brightness of the star.

In contrast to the optical, where stellar light is a major contributor, or the UV, where light from young massive stars often dominates, or the IR, where dust radiation from massive stars dominates, or the radio, where emission from HII regions, young supernovae, and other indicators of rapid star formation are often very important, there are very few sources of radiation that can confuse the issue in the hard X-ray band.

Point-like X-ray emission is easy to recognize as being caused by low-luminosity AGN.

Using surveys of the low-redshift universe as a guideline, if the total integrated X-ray luminosity of a small object is greater than 10^{42} ergs s^{-1}, then the object is almost certainly an AGN.

In the low-redshift universe, there are no galaxies with a total (non-AGN) luminosity exceeding this level.

Thus, even without detailed X-ray spectra or imaging, the identification of the nature of the source is clear.

X-rays are also rather penetrating.

Thus, there are no dark ages for very high-redshift AGN in the X-ray band caused by the Gunn-Peterson effect. ..

From a more physics oriented point of view: the X-ray emission originates from very close to the central black hole, often shows large amplitude rapid variability, and is characterized by a non-thermal spectrum.

Thus, the X-ray properties are directly connected to the black hole nature of the AGN and are not due to reprocessing of the radiation.

The fundamental properties of black holes should not be functions of metallicity or environment but only of mass, accretion rate, and black hole spin.

Since the X-ray flux originates from very close to the event horizon, the X-ray properties of high-redshift primordial black holes should be very similar to that of lower redshift objects.

This allows a reasonable calculation of their observable properties at high redshifts.

Cosmic Times: Poster exercices.

The students should be able to summarize reading material.

Materials:

• Cosmic Times Posters
• Cosmic Times Gallery Walk Worksheets
• chart paper
• markers, pens or pencils

Preparation:

- Number the Cosmic Times Posters one to six from the earliest to the latest.
- Display the posters around a room with ample space around each Next to each poster place a piece of chart paper and writing implements.

Procedure:

- Engagement.

- Ask for students: what they know about Big Bang theory.
- Was this always the leading theory for the origin of the Universe?

- **Does our understanding of the Universe change over time?**
- **What drives scientific discovery?**
- **Students may think that science is done, and that scientists have all the answers.**

Hopefully, they recognize that science is an active discipline where new technologies are feeding new discoveries.

Either way, the gallery walk will help students see how scientific advances have helped astronomers come to their current understanding of the nature of the Universe.

To get in the magazine with a lot of information and excercises will come again in the future, images and writings.

Readings:

- **Part of: Einstein**
- **OPINIONS AND APHORISM**
- **ON RADIO**
- **ON SCIENCE**

MISCELLANEOUS.

R.Mushotzky.

NASA/Goddard Space Flight Center

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Posted by Veronica IN DREAM at 1:16 PM