

## High-Impact Astronomical Observatories

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We derive the ranking of the astronomical observatories with the highest impact in astronomy based on the citation analysis of papers published in 2006. We also present a description of the methodology we use to derive this ranking. The current ranking is lead by the Sloan Digital Sky Survey, followed by Swift and the Hubble Space Telescope.

### 1. INTRODUCTION

Many studies focus on the cost of astronomical facilities while very little work is done trying to evaluate the returns of telescopes and satellites used in astronomy (Saleh *et al.* 2007). We analyze the most cited papers published in 2006 and cited during the last two years to derive a ranking of the telescopes with the highest impact in astronomy during that year. Objective measurements of productivity and impact are necessary in order to take informed decisions about science policies, scientific directions, funding and lifetime extension of a given telescope. This particular ranking has been widely used in the past to support the work of various committees and these results were incorporated in their reports, a fresh study on a newer dataset of high-impact papers is due.

### 2. METHODOLOGY

We draw the ranking of the most influential astronomical facilities based on their contribution of data to the most cited papers on a given year. The technique described below was implemented during the development of a series of tools to estimate the overall impact of the Hubble Space Telescope in astronomy (Meylan *et al.* 2004). This particular technique of telescope evaluation was created based on the method set forth by Benn & Sanchez (2001).

A detailed account of the method used to derive the ranking of the observatories with the highest impact, and results of this exercise in previous years, was given in Madrid & Macchetto (2006). In the following paragraphs we will give a brief summary of the approach that we use to generate the aforementioned ranking.

The 200 most cited papers published in a given year constitute a sample large enough to provide a snapshot of the most influential papers published in astronomy for that particular year. In fact the 200 most cited papers in 2006 constitute only 0.2 % of all the references indexed by the ADS but they account for 9.5 % of the citations. Moreover, as shown in Madrid & Macchetto (2006), the 200 most cited papers stand out from the rest of publications in the distribution of citations per paper on a given year.

We obtained the 200 most cited papers published in 2006 through the SAO/NASA Astrophysics Data System (ADS). The ADS is the most widely used bibliographic database in astronomy. We went through the onerous process of downloading each of these 200 most cited papers. Each paper was then analyzed and we determine whether the paper was observational or theoretical. Theoretical papers usually present models and do not contain any data taken with a telescope. On the other hand, an observational paper is a paper that presents data obtained with a telescope or several telescopes.

For those observational papers we determine which facility, or more often, which facilities the authors used to gather their data.

The number of citations of each paper is credited to the telescope used to take the data. The telescope that accumulates the largest number of citations will thus end up on the top of our ranking. When several telescopes provide data for a publication a percentage of participation, or weight, is established and a fractional number of citations is credited to each contributing facility proportional to their participation. Examples of these basic arithmetics are given in Madrid & Macchetto (2006).

### 3. RESULTS

The results of this study are summarized in Table 1 which presents the top-ten high impact astronomical observatories.

The Sloan Digital Sky Survey is once again the telescope with the highest impact in astronomy, see Madrid & Macchetto (2006, and references therein) for previous rankings. The SDSS published its fourth data released in 2006. Swift, a telescope dedicated to the science of GRB, ranks second, the findings made by this telescope has clearly transcended the field of GRBs and has had a broad impact in astronomy.

The Hubble Space Telescope ranks third. Several papers from the Advanced Camera for Surveys Virgo Cluster Survey, as well as the publication in 2006 of the Hubble Ultra Deep Field, contributed to rank HST as the third telescope with the highest impact.

Ground based optical and infrared astronomy has an important share of participation in the high impact papers with ESO, Keck, and the CFHT.

Spitzer and Chandra rank 7th and 8th, it is worth noting that all active NASA Great Observatories belong to the top ten high impact astronomical telescopes.

TABLE 1. High-Impact Observatories

Rank	Facility	Citations	Participation
1	SDSS	1892	14.3%
2	Swift	1523	11.5%
3	HST	1078	8.2%
4	ESO	813	6.1%
5	Keck	572	4.3%
6	CHFT	521	3.9%
7	Spitzer	469	3.5%
8	Chandra	381	2.9%
9	Boomerang	376	2.8%
10	HESS	297	2.2%

The High Energy Stereoscopic System (HESS) ranks 10th. This system of imaging atmospheric Cerenkov telescopes is located in Namibia and aims to image very high energy phenomena. The facilities that rank 11th to 15th and thus do not appear on Table 1 are WMAP, 2MASS, Gemini, Subaru, and NOAO (CTIO+KPNO).

We have made extensive use of the NASA Astrophysics Data System Bibliographic services.

## REFERENCES

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