HST/JWST Science Categories and Keywords

STUC

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Rationale

- The keywords are important for tracking what type of science HST supports. Most of the keywords date back to their introduction in Cycle 10. We have had a number of small changes to the HST keywords over the past but have not conducted a review to determine how well they match current scientific interests.
- We have a requirement to develop a set of scientific keywords for JWST. Ideally, we would want to maintain continuity with respect to HST, so we need to determine whether and how the current set might need to be modified.

Working Group

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- Should we continue to use a two-tier science category/science keyword system for HST and JWST?
- Should there be any changes to the current list of science categories? Can we improve the definition of the science categories?
- Should we develop closer synergies with keyword use in scientific journals?
- Are there science topics that will be accessible to JWST that are not covered by the current science categories and/or science keywords? Should we add categories and/or keywords?
- Are all of the current science keywords necessary? Should we eliminate or convolve any science keywords?

Current System

- HST proposals are classified using a two-tier system
- Proposers use APT to select one of 14 science categories and identify a number of associated science keywords
- Science categories and keywords serve two different purposes
- Categories are used to assign the proposals to a set of mirror panels.
- Keywords are used to match proposals and panelists according to expertise

14 Categories are assigned to 6 Sets of Mirror Panels

- *Solar System*, *Extrasolar Planets* and *Debris Disks* are reviewed by 2 "Planets" panels
- *Cool Stars*, *Hot Stars*, *Resolved Star Formation*, and *ISM and Circumstellar Matter* are reviewed by 3 "Stars" panels
- *Resolved Stellar Populations* are reviewed by 2 "Stellar Populations" panels
- *Unresolved Stellar Populations and Galaxy Structure*, *ISM in External Galaxies*, and *Unresolved Star Formation* are reviewed by 3 "Galaxies" panels
- *AGN/Quasars* and *Quasar Absorption Lines and IGM* are reviewed by 2 "AGN and IGM" panels
- *Cosmology* is reviewed by 2 "Cosmology" panels.

Keywords are used to assign Reviewers to Proposals

- Once the proposals have been assigned to a set of mirror panels, the panelists are chosen as reviewers for a subset of proposals
- A proposal has 3 to 5 keywords, and panelists are requested to provide up to 10 keywords
- Software calculates a score for each proposal/panelist pairing and assigns proposals to panelists based on scores, reviewer workload, and conflicts
- The Call for Proposals associates the science keywords with science categories (Generic, Planetary, Galactic, Galactic +Extragalactic, Extragalactic). However, a proposer is free to choose any keyword, regardless of the science category

Working Group Recommendation

- The current two-tier system is working reasonably well and should be kept. However, the system can be improved by addressing its weaknesses:
  - There are too many categories, leading to proposer error and uneven proposal load in the panels
  - The nomenclature used for the categories is sometimes confusing
  - It should be more transparent to the proposers which panel will review their proposals
  - Some keywords are obsolete
  - Some research areas have no appropriate keywords
  - Keywords should be panel specific

Proposed HST/JWST Science Categories

- *Planets and Planet Formation Panel* (Solar System, Extra-solar Planets, Debris Disks)
- *Stellar Physics Panel* (Cool Stars, Hot Stars, Resolved Star Formation, ISM and Circumstellar Matter)
- *Resolved Stellar Populations Panel* (Resolved Stellar Populations)
- *Galaxies Panel* (Unresolved Stellar Populations and Galaxy Structure, ISM in External Galaxies, Unresolved Star Formation)
- *Massive Black Holes and their Hosts Panel* (AGN/Quasars)
- *Large-Scale Structure of the Universe Panel* (Quasar Absorption Lines and IGM, Cosmology)

Proposed HST/JWST Science Keywords

- The working group recommends keeping a set of scientific keywords in support of the proposal/panelist matching process
- In the future, a set of fixed keywords may become obsolete if parsing software will be able to match proposals and reviewers on the basis of the scientific justification. A feasibility study will be conducted in 2015
- Each science category has its own set of keywords, with some keywords appearing in more than one category
- The optimum number of keywords in each category is 15 – 20. Too few keywords would make them too broad, and too many would result in very few matches between proposal and panelist selected keywords
- Each category allows the specification of a wildcard keyword (e.g., "STANDARD STARS") even if this keyword would most likely not be selected by a panelist
- The current scientific keyword "SUPPORT OF NASA PLANETARY OR EXOPLANETARY MISSIONS" should not be used. Rather, it is recommended to add a flag to APT indicating mission support

Revised Science Keywords I

Planets and Planet Formation
BIOMARKERS
CHEMICAL COMPOSITION
COMETS
CORONAGRAPHY
DISKS
EXOPLANET HOST STARS
EXTRA-SOLAR PLANETS
GIANT PLANETS
KUIPER-BELT OBJECTS
MINOR PLANETS
PLANETARY ATMOSPHERES
PLANETARY SATELLITES
SPACE WEATHER
TERRESTRIAL PLANETS
TRANSITS
WILDCARD

Stellar Physics
ACCRETION DISKS AND JETS
ASTROMETRY
ATMOSPHERES
BINARIES
CHEMICAL ABUNDANCES
CIRCUMSTELLAR MATTER
COOL STARS
DUST
EVOLUTION
EVOLVED STARS
GAMMA-RAY BURSTS
HII REGIONS
HOT STARS
INTERSTELLAR MEDIUM
LOW-MASS STARS
MAIN-SEQUENCE STARS
MASSIVE STARS
MOLECULAR CLOUDS
NEUTRON STARS AND PULSARS
PLANETARY NEBULAE
PRE-MAIN-SEQUENCE STARS
RADIATIVE TRANSFER
SUPERNOVAE
TRANSIENTS
VARIABLE STARS
WILDCARD

Resolved Stellar Populations
ASTROMETRY
CHEMICAL ABUNDANCES
COLOR-MAGNITUDE DIAGRAMS
COOL STARS
DISTANCE LADDER
DUST
EVOLUTION
GALACTIC CENTER
GALACTIC STRUCTURE
GLOBULAR CLUSTERS
HII REGIONS
HOT STARS
INTERSTELLAR MEDIUM
LOCAL GROUP GALAXIES
MAGELLANIC CLOUDS
MICROLENSING
PLANETARY NEBULAE
STAR CLUSTERS
WILDCARD

Revised Science Keywords II

Galaxies
BULGES, SPHEROIDS AND ELLIPTICALS
DISKS AND SPIRALS
DUST
DWARF GALAXIES
EMISSION LINE GALAXIES
EXTRA-GALACTIC LEGACY & DEEP FIELDS
GALAXY FORMATION AND EVOLUTION
SPECTRAL ENERGY DISTRIBUTIONS
INTERACTING/MERGING GALAXIES
IR-LUMINOUS GALAXIES
IRREGULAR GALAXIES
LOCAL GROUP GALAXIES
MAGELLANIC CLOUDS
PHOTOMETRIC REDSHIFTS
QUENCHED GALAXIES
SCALING RELATIONS
SIMULATIONS & MODELS
STAR CLUSTERS
STARBURST GALAXIES
STAR-FORMATION HISTORIES
STELLAR HALOS
STELLAR POPULATIONS
STRUCTURE AND MORPHOLOGY
WILDCARD

Massive Black Holes and Their Hosts
ACCRETION DISKS
AGN HOST GALAXIES
BAL QUASARS
EMISSION LINES
HIGH-LUMINOSITY AGN/QUASARS
JETS
LINERS
LOW-LUMINOSITY AGN/SEYFERTS
RADIO AGN
REVERBERATION
SUPERMASSIVE BLACK HOLES
WINDS AND OUTFLOWS
X-RAY AGN
WILDCARD

Large-Scale Structure
CHEMICAL ABUNDANCES
CIRCUMGALACTIC MEDIUM
CLUSTERS OF GALAXIES
COOLING FLOWS
COSMOLOGICAL PARAMETERS & DISTANCE SCALE
DAMPED LY-ALPHA ABSORPTION SYSTEMS
DARK MATTER HALOS
EXTRA-GALACTIC LEGACY & DEEP FIELDS
FIRST LIGHT STARS AND GALAXIES
GALAXY ENVIRONMENTS
GAMMA-RAY BURSTS
GRAVITATIONAL LENSING
GROUPS OF GALAXIES
GUNN-PETERSON EFFECT
INTRACLUSTER MEDIUM
LARGE-SCALE STRUCTURE
LYMAN-ALPHA FOREST
METAL ABSORPTION SYSTEMS
REIONIZATION
SIMULATIONS & MODELS
SUPERNOVAE
WILDCARD