

# Faculty Performance Documentation – 2013

Name: Barnes, Joshua Edward Rank: R5

## 1 Introduction

Workload Distribution

Research	Teaching	Service & Support
30 %	30 %	40 %

Citations

2010	2011	2012
358 / 532	254 / 414	307 / 461

I was the Graduate Program Chair until 06/2010 and have served as acting chair on a number of occasions since then. Throughout 2010–12, I have been deeply involved in the creation of undergraduate Astronomy and Astrophysics programs at UH Manoa.

I have 30 papers with 30 or more citations; I am the sole author on 10 of these papers and the lead author on another 10. My most-cited paper currently has 1057 citations.

## 2 Research Activities

### 2.1 Research Accomplishments + Awards, Prizes, etc.

- My main area of research is galactic dynamics, with a particular focus on galaxy collisions. I use numerical simulations to explore the underlying physics and to assist the interpretation of observational data. I also develop methodologies and algorithms useful for other dynamical simulations.
- I am interested in the problem of modeling collisions of real, specific galaxies. I believe that realistic, data-driven models of actual colliding galaxies are needed to interpret observations and define the role of collisions in galactic evolution. I recently developed the “Identikit” algorithms to reconstruct galactic collisions from available morphological and kinematic data.
- Such models are not unique, since observations constrain only half of the phase-space dimensions and cannot directly determine the distribution and kinematics of dark matter. I have found that some key parameters, including time since first passage, are robustly determined despite the observational ambiguities.
- To further explore uncertainties associated with the structure of dark halos, I have developed a large suite of disk galaxy models. These models are being used to examine the relationship between halo structure and collision outcome.
- The construction of this suite of models required a detailed examination of “softening” in numerical simulations.
- I am also interested in using models of colliding galaxies to test recipes for star formation and other “sub-grid” physics included in galactic simulations. Such tests are critical for understanding how galactic collisions trigger starbursts.
- I am an active participant in the GOALS collaboration, organized by Aaron S. Evans (Virginia), and an occasional participant in COSMOS, organized by Nick Scoville (CALTECH). I am also collaborating with Jennifer Lotz (STScI) and her postdoc, Alireza Mortazavi.

## 2.2 Publications – Past 3 Years

### Peer Reviewed Articles Published, in Press or Submitted

- [1] U, V., et al. 2012, “Spectral Energy Distributions of Local Luminous and Ultraluminous Infrared Galaxies”, *ApJS*, **203**, 9
- [2] **Barnes, J.E.** 2012, “Gravitational softening as a smoothing operation”, *MNRAS*, **425**, 1104
- [3] Modica, F., et al. 2012, “Multi-wavelength GOALS Observations of Star Formation and Active Galactic Nucleus Activity in the Luminous Infrared Galaxy IC 883”, *AJ* **143**, 16
- [4] **Barnes, J.E.** 2011, “Identikit 2: An Algorithm for Reconstructing Galaxy Collisions”, *MNRAS*, **413**, 2860
- [5] Fernandez, X., et al. 2010, “A Radio Perspective on the Wet Merger NGC 34”, *AJ*, **140**, 1965
- [6] Chien, L.-H., **Barnes, J.E.** 2010, “Dynamically driven star formation in models of NGC 7252”, *MNRAS*, **407**, 43
- [7] Inami, H., et al. 2010, “The Buried Starburst in the Interacting Galaxy II Zw 096...”, *AJ*, **140**, 63
- [8] Rupke, D., Kewley, L., **Barnes, J.E.** 2010, “Galaxy Mergers and the Mass-Metallicity Relation...”, *ApJ*, **710**, 156

### Conference Proceedings (Invited and Contributed Papers)

- [1] **Barnes, J.E.**, Privon, G.C. 2011, “Experiments with IDENTIKIT”, *Galaxy Mergers in an Evolving Universe*, in press.
- [2] Rupke, D., Kewley, L., **Barnes, J.** 2010, “Redistribution of Metals in Interacting Galaxies”, *Galaxy Wars: Stellar Populations and Star Formation in Interacting Galaxies*, ASPC **423**, 355

### Astronomy Meeting Abstracts, Posters, and IAU Circulars

- [1] N/A

### Telescope Bulletin Articles, Book Reviews, Popular Articles, & Non-Refereed Work

- [1] **Barnes, J.E.** 2011, “ZENO: N-body and SPH Simulation Codes”, Astrophysics Source Code Library, record ascl:1102.027
- [2] **Barnes, J.E.** 2011, “Identikit 2: An Algorithm for Reconstructing Galactic Collisions”, Astrophysics Source Code Library, record ascl:1102.011
- [3] **Barnes, J.E.**, Hibbard, J.E. 2010, “Identikit 1: A Modeling Tool for Interacting Disk Galaxies”, Astrophysics Source Code Library, record ascl:1011.001
- [4] **Barnes, J.E.**, Hut, P., Teuben, P. 2010, “NEMO: A Stellar Dynamics Toolbox”, Astrophysics Source Code Library, record ascl:1010.051

### Books and Book Chapters

- [1] N/A

### 2.3 Postdocs supervised

Name	Position	Dates	Description
N/A			

### 2.4 Invited Reviews, Research Talks and Colloquia

Date	Event	Location	Description
07/17/12	Colloquium	Rose Center, NY	Experiments with IDENTIKIT
10/24/11	Invited Talk	GMiEU, Taiwan	Experiments with IDENTIKIT
04/29/11	Research Talk	IfA	Modeling NGC 4676 with IDENTIKIT
07/06/10	Colloquium	NAOJ, Tokyo	Identikit 2: An Algorithm...

### 2.5 Research Grants & Other Research Funding – Past 3 Years

#### Existing Funding

Dates	Amount	Role	Agency	Description
N/A				

#### Pending Proposals

Date Submitted	Amount	Role	Agency	Description
N/A				

#### Unsuccessful Proposals

Date Rejected	Amount	Role	Agency	Description
4/19/2012	\$312,226	PI	NSF	Merger Modeling with IDENTIKIT

### 3 Teaching Activities

#### 3.1 Graduate Students and Other students supervised

Name	Position	Dates	Description
J. Chu	PhD student*	S11–now	Dissertation: Spectra of $z > 2$ Galaxies
K. Larson	PhD student*	S10–now	Dissertation: Stellar Populations in Local LIRGs
Z. Gazak	PhD student*	F10–now	Dissertation: Extragalactic Red Supergiants
G. Privon†	PhD student*	F10–now	Dissertation: Atomic & Molecular Gas in LIRGs
V. U	PhD student*	S09–S12	Dissertation: Kinematics & Energetics of LIGs
A. Roussanova	Grad student	F09–S10	Astr 699 Project: Wide Galaxy Encounters

\* — JB serves as a dissertation committee member.

† — Astronomy Department, University of Virginia.

#### 3.2 Regular Courses Taught During the Past 3 Years

Course	Sem.	Credits	Enroll	Eval	Title
A241	F12	3	8	4.86	Foundations of Astrophysics I
A110L	F11	1	19	4.72	Astronomy Laboratory
A110L	F10	1	22	4.47	Astronomy Laboratory
A110	S10	3	68	4.33	Survey of Astronomy

#### 3.3 Comments on Teaching

My work supervising George Privon, a student of IfA alum Aaron Evans, is very rewarding. George is completing a dissertation involving both observations and numerical simulation, and has visited the IfA several times. We have already published one conference proceeding, and just had a paper accepted by the ApJ.

Astr 241 presented an interesting challenge. It is intended as the first course in a sequence leading to an undergraduate Astrophysics degree, and has never been taught before. The subject matter – Solar System Astrophysics – is somewhat outside my normal area of research. However, I really enjoyed learning the material and it appears the students liked it as well.

In Spring 2012, I conducted a two-night astronomy class for students from the Honolulu Waldorf High School. These classes were held on Molokai as part of the 11<sup>th</sup>-grade service learning trip. We were able to view a number of solar-system and deep-sky objects.

## 4 Service & Support Activities

### 4.1 IfA Committees

Year	Committee	Workload	Description
2010	FAC	15 hr	Faculty Advisory Committee
2010	NRC	20 hr	NRC Postmortem Analysis
2010	ADMIT	200 hr	Admissions Committee (Chair)
2010	QUAL	25 hr	Graduate Qualifying Exam Committee
2010	GROG	100 hr	Graduate Research Oversight Group (Chair)
2010	AWARDS	10 hr	IfA Awards Committee
2011	ADMIT	50 hr	Admissions Committee
2011	GROG	25 hr	Graduate Research Oversight Group
2011	FRC	50 hr	Faculty Review Committee
2011	RETREAT	125 hr	Lead FRC white paper; Co-lead undergrad program
2012	ADMIT	50 hr	Admissions Committee

### 4.2 UH Committees

Year	Committee	Workload	Description
2010	Dir. Search	50 hr	Search committee for IfA Director
2012	TPRC	75 hr	Tenure & Promotion Review Committee (Chair)

### 4.3 Community / Local Committees

Year	Committee	Workload	Description
N/A			

### 4.4 National / International Committees / Journal Editorships

Year	Organization	Workload	Description
N/A			

### 4.5 Public Outreach Events

Date	Event	Location	Description
2012	Venus Transit	Honolulu Waldorf School	Set up telescopes, explained event
annual	Open House	IfA Manoa	Develop, set up, operate solar spectrum viewer

#### 4.6 Institutional Grants & Other Institutional Funding – Past 3 Years

##### Existing Institutional Funding

<b>Dates</b>	<b>Amount</b>	<b>Role</b>	<b>Agency</b>	<b>Description</b>
9/1/10–8/31/11	\$27,812	COI	Am. Soc. Eng. Edu.	T.R. Swindle Scholarship
9/1/11–8/31/12	\$3,144	COI	Am. Soc. Eng. Edu.	T.R. Swindle Scholarship

##### Pending Institutional Proposals

<b>Date Submitted</b>	<b>Amount</b>	<b>Role</b>	<b>Agency</b>	<b>Description</b>
N/A				

##### Unsuccessful Institutional Proposals

<b>Date Rejected</b>	<b>Amount</b>	<b>Role</b>	<b>Agency</b>	<b>Description</b>
N/A				

#### 4.7 Comments on Service and Support

Major service & support activities include (1) graduate program chair, (2) faculty retreat and visiting committee preparations, and (3) undergraduate program development.

**Grad chair.** I served as chair through Spring 2010, and as acting chair on many subsequent occasions. Responsible for all areas of graduate (and undergraduate) programs, including teaching assignments, graduate admissions, GROG, qualifying exams, student progress, teaching assistantships, web pages.

**Retreat & visit.** In preparation for the 2011 Faculty Retreat, I analyzed statistics on faculty rankings, chaired discussions of the Faculty Review Committee in IfA faculty meetings, and drafted a white paper on the FRC; this was included in the self-study prepared for the 2012 IfA Visiting Committee. I was also involved in developing material for the white paper on teaching, and presented versions of the undergraduate curricula at the 2011 Retreat and 2012 Visit.

**Undergrad program.** Starting in 2011, I led the development of the undergraduate Astronomy and Astrophysics curricula. This included defining overall course sequences, drafting course descriptions, reconciling the proposed programs with University of Hawaii undergraduate degree requirements, and writing supporting material. I also created detailed course proposals for ASTR 241, 242, 300, 300L, and 301; all of these proposals were subsequently approved by the Natural Sciences and UHM curriculum committees.