UCO Board Meeting

S. M Faber, Interim Director

UCO Participants: James Graham, Andrea Ghez, Xavier Prochaska, Aaron Barth, Maureen Mclean

May 8, 2013

Part I: FY14 Budget Request

UCO is a different and stronger organization

* UCSC faculty and elsewhere:
  - Smaller: down from 15 FTE in 2004 towards 7+Director in steady state ("glide path")
  - 9-month appointments will be the new base
  - Opportunity for service (with compensation) for faculty around the system
  - Well defined duties with goals and milestones
  - Annual review by UCOAC
  - Finite terms; renewable on favorable review
  - Macintosh offer is proceeding – **crucial to strategic plan emphasis on AO**
  - **Buyout funding needs to be regular part of Director's budget**

* A much more engaged UC astronomical community, including an active UCOAC:
  - Strategic plan nearing completion
  - Astronomers unified on key points:
    - Science priorities: 1) Keck + TMT, 2) instruments for Keck + TMT, 3) Lick (five years)
    - Number and responsibilities of UCO faculty at UCSC, UCLA, and systemwide
    - Structured on 9-month appointments
    - Headquarters at UCSC
    - Under a flat budget, operate Lick for 5 years, then shift resources to Keck & TMT

UCO is a different and stronger organization

* Lick long-term planning has begun in earnest:
  - Wider awareness of Lick opportunity cost gives impetus: ~$2.0 M
  - UCO Board directive provided further impetus
  - Collaboration has started between ORGS and UCO staff: “plan to plan”
  - Outreach to Kitt Peak and Mount Wilson, which have similar issues
  - Opportunities for collaboration, “astro-tourism”
  - **Planning will take time and additional resources.**

* Interim Director: Progress needs tangible long-term commitments by both UCOP and UCSC for budget, facult, and facilities

* UCSC Instrument Laboratory renovation:
  - Requirements document with various building scenarios exists
  - UCSC campus Physical Planning is cooperating
  - Awaiting firm signal of support from UCSC Chancellor, who is awaiting a firm signal of commitment to UC O/IR astronomy by UCOP.

UCO BOARD COULD HELP BREAK LOGJAMS!

FY14 Budget: History and Assumptions

History:

- 10/30/12 and earlier: FY14 would be flat at $7.548 M.
- 10/30/12: I promised a balanced budget for FY14 but assumed retain faculty retirements.
  Dorr urged me to pursue them.
- 1/10/13: Dorr email: Faculty retirements will NOT be retained in FY14.
  AND, pay debt of $650 K.

EFFECT: Remove $1.6 M from budget ($1 M faculty savings, $0.65 debt)

- 4/10/13: Brostrom and Jones urged me to submit a budget (not usual practice).
- 4/15/13: Version 1: Assumed $7.548 M and argued to retain retirements.
- 4/15/13: Conference call (UCOP, UCSC, UCO):
  Version 2: Faculty not in budget, do not mention retirements, submit a zero-based budget, but no cap.

FY14 Budget: History and Assumptions

Budget assumptions:

- TMT will go ahead, with UC in it.

- UCO faculty salaries are removed from budget; repay some debt.

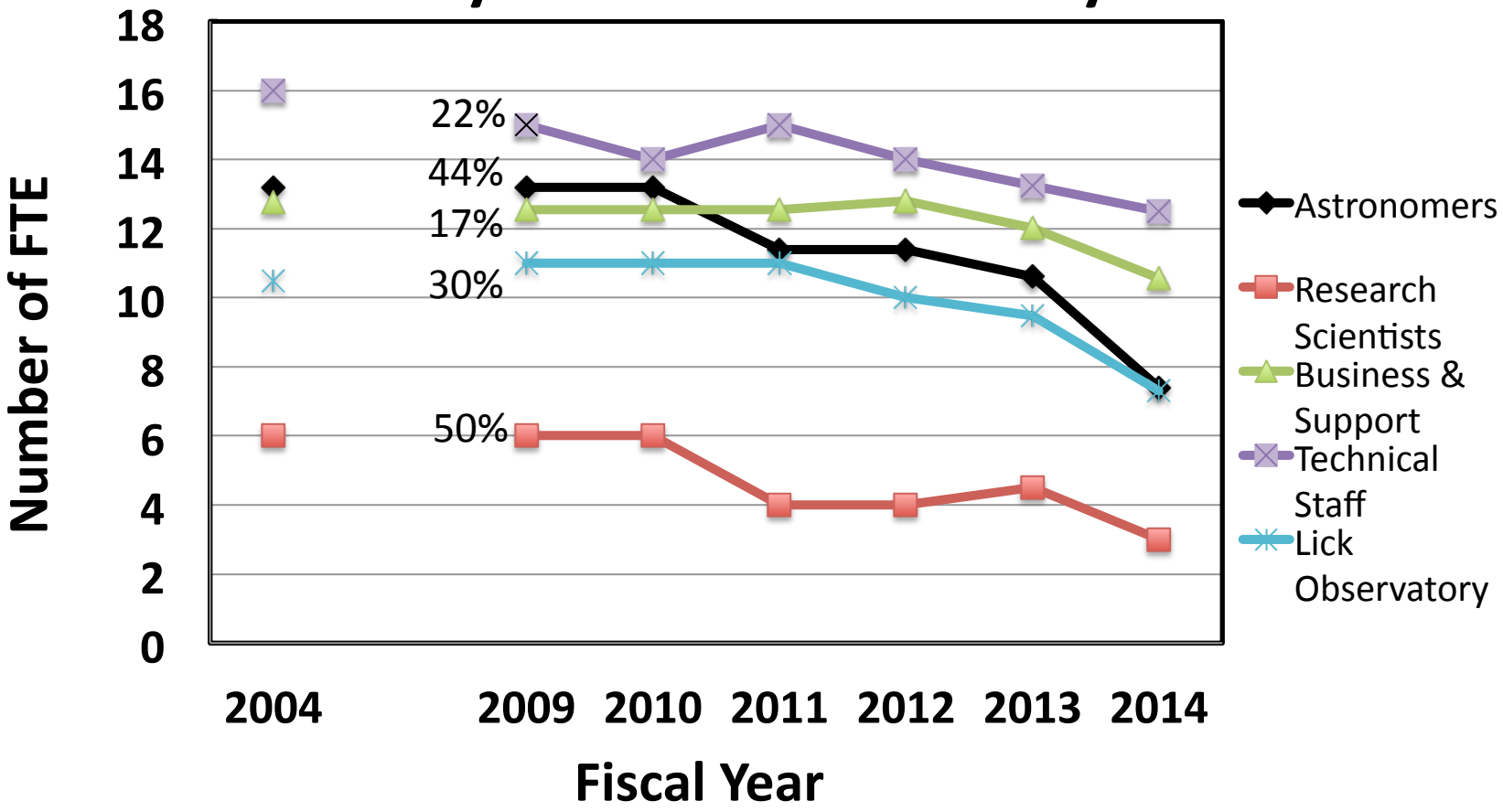
- Duties of remaining 11-month UCO faculty are unchanged after July 1.

- Highest possible weight to Keck and TMT instrumentation while at the same time operating Lick in spartan mode.

- Faithful to priorities in Astronomy Task Force report, External Review committee, and Portfolio Review Group report.

- This is a zero-based budget that is justified from first principles; no arbitrary cap.

UCO Core Funded FTE have dropped 30% over 10 years and 25% over 5 years.



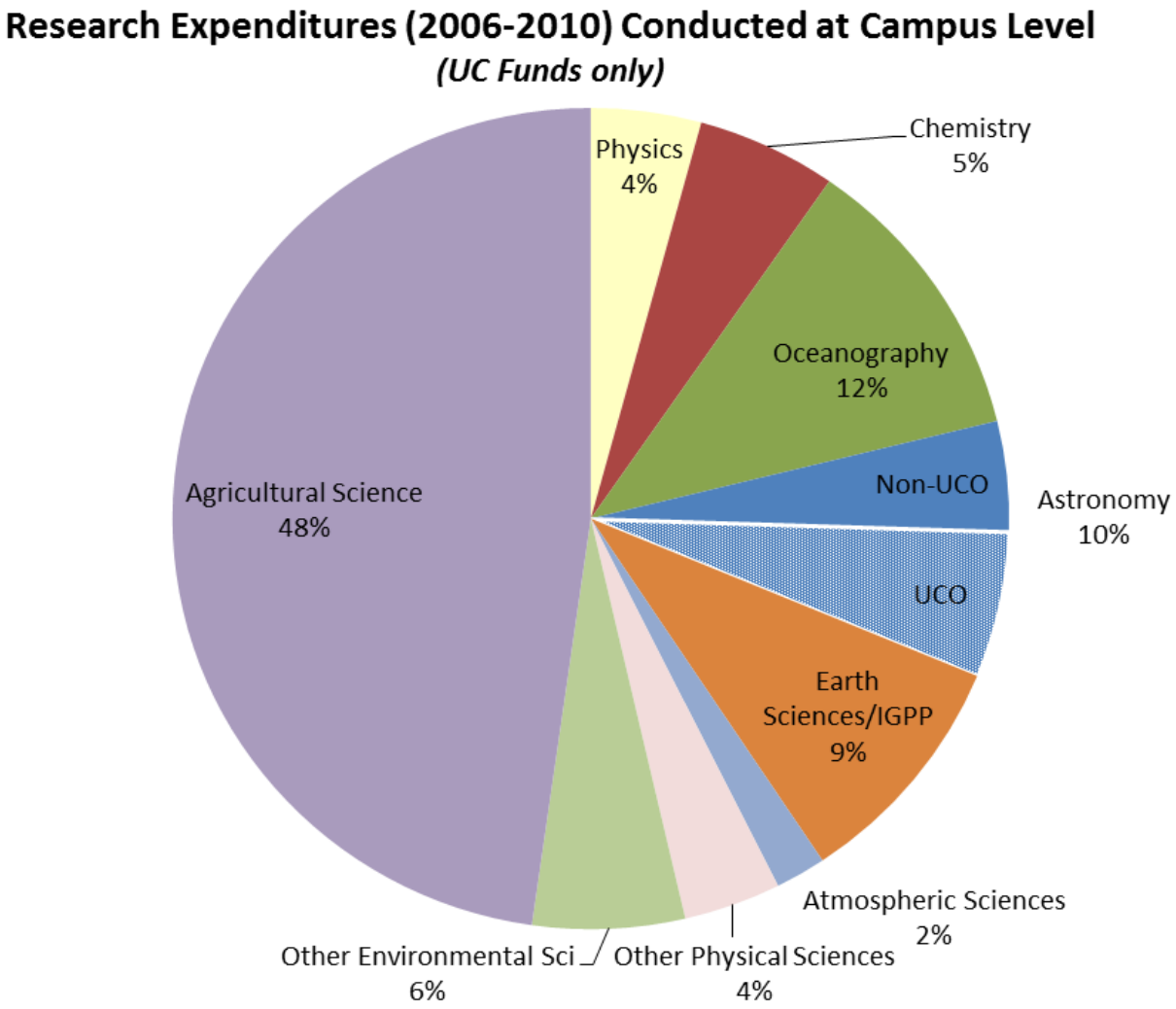
UCSC average staff decline is 20% over 5 years

UC Santa Cruz employees paid from General Funds and Tuition

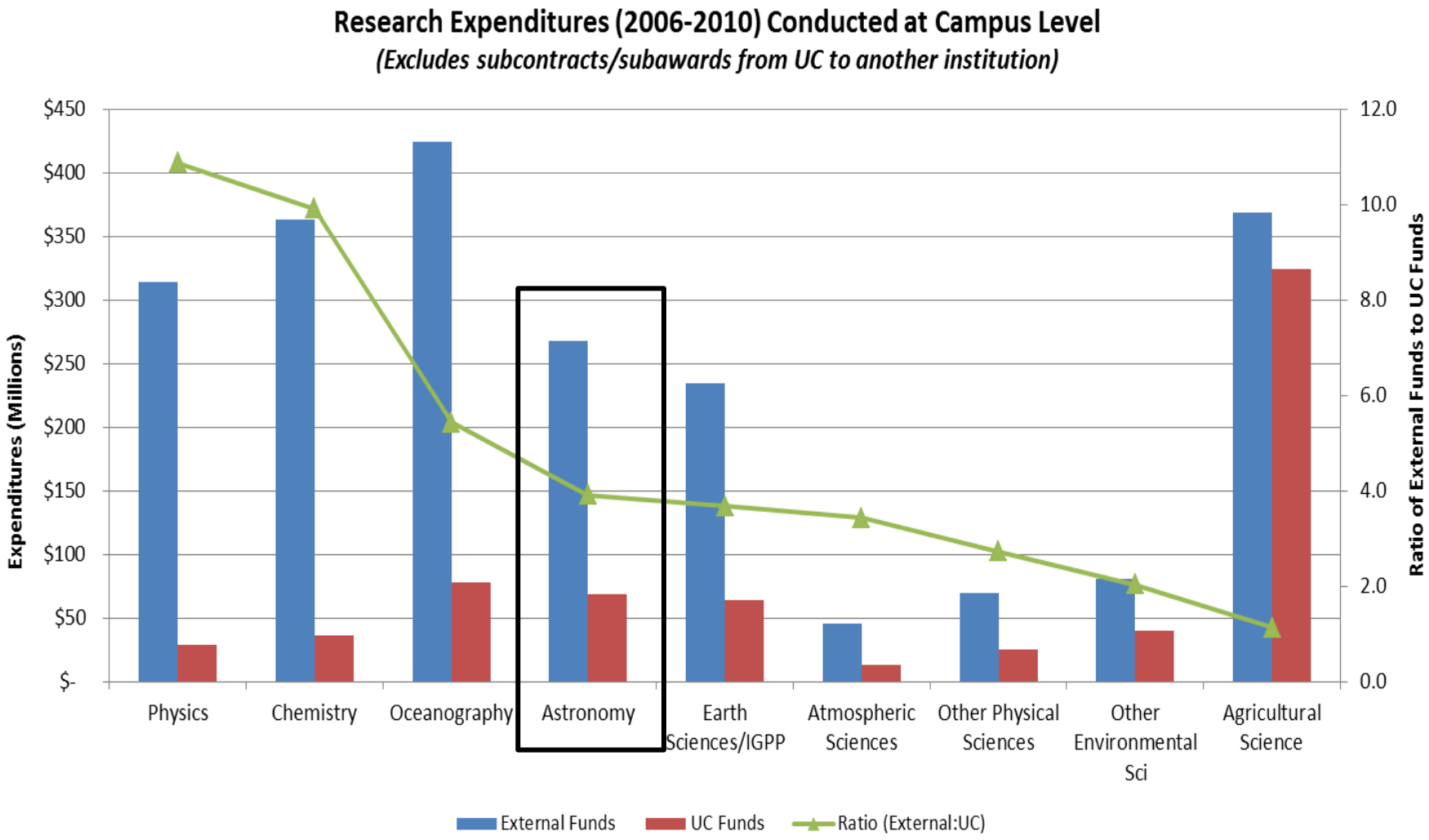
(October payroll full-time equivalents)

	2008	2009	2010	2011	2012	Change	
Ladder Faculty	498	498	487	487	458	**-40**	**-8%**
Other Academic	317	270	274	251	247	**-70**	**-22%**
SMG & MSP	108	106	97	86	83	**-25**	**-23%**
Staff	1,309	1,203	1,151	1,029	996	**-313**	**-24%**
Total faculty and staff employees	2,232	2,077	2,009	1,852	1,784	**-448**	**-20%**
Student Employees	432	369	375	370	380	**-52**	**-12%**

Astronomy does not dominate UC research funding



Astronomy's return on UC investment is typical



Astronomy is not more expensive than other sciences

From: UC Investment in Astronomy vs. Other Sciences, by J. P. Brodie and S. M. Faber, April 2013

Table 1
UC State Funds Invested per UC Scientist

	Keck Astronomer	Laboratory Scientist
(a) Capital costs	$0.93 M	$1.74 M
(b) Start-up	0.34	1.63
(c) Operations over 30 yr	3.00	0.84
Lifetime total (a+b+c)	$4.27 M	$4.21 M

The value of ***sustained*** scientific investment

UC scientists in the National Academy of Sciences:

			Sustained UC investments
Astronomers:	24/96	25.0%	UCO, Lick, Keck, TMT
Physicists:	30/163	18.4%	
Chemists:	23/168	13.7%	
Geologists:	14/71	19.7%	
Geophysicists:	22/68	32.2%	Scripps Institution of Oceanography
Plant biology:	14/39	35.9%	ANR programs

Lick and Scripps both PREDATED the founding of their campuses. Lick was founded in 1888, Scripps in 1903. They became the nuclei and magnets for UCSC and UCSD.

UC's Biology and medicine average not counting Plant Bio is 16.8%.

FY14 Core Budget: "Barely-Breathing"

Category	FY13 (actual)		FY14 (requested)		Δ(FY14-FY13)	
	FTE	$(M)	FTE	$(M)	FTE	$(M)
Faculty	10.60	2.508	7.40	1.540	-3.20	0.968
		Faculty not in sums below				
Faculty stipends		0.033		0.025		0.008
TECHNICAL GROUP:						
Research scientists	4.50	0.823	4.00	0.732	-0.50	-0.091
Engineers & technicians	17.00	2.441	16.50	2.392	-0.50	-0.049
Business & support staff	13.05	1.259	11.60	1.158	-1.45	-0.101
Lick Observatory staff	10.01	1.037	7.30	0.728	-2.71	-0.309
Staff salary & benefit increases	N/A	0.000	N/A	0.109	N/A	0.109
Non-salary expenditures	N/A	0.600	N/A	0.600	N/A	0.000
UCLA IR Lab	N/A	0.300	N/A	0.340	N/A	0.040
TOTAL EXPENDITURES:	44.56	6.493	39.40	6.084	-5.16	-0.409

Many different skills are needed on the UCSC technical staff. We cannot cut numbers further without losing an essential skill, which would kill projects and actually reduce revenue.

Projects →

People ↓

Table 1. UCO TECHNICAL STAFF DISTRIBUTED ACROSS FY14 PROJECTS
(HOURS)

FY14	TMT MOBIE	NEW COATINGS CONTRACT	GPI	Keck KCWI CAMERA	Keck KCWI Detector	Keck Encoder	Keck Laser Launch	Keck Deploy Tertiary	Auto Planet Finder Tel	Shane AO Laser	LLNL Predictive AO	TMT Software	COATINGS RESEARCH	Remote Obs support	Keck Next Gen AO	Shane KAST upgrade	Lick Ops Support	Lick Data Archive	Lick CCD Camera S/W	Shane Aluminize	Shane AO System	Shane AO Camera	New Proposals	FY14 TOTAL
ME/Radovan	1462																							1462
ME/Cabak				400		100		730		160						220							450	2060
ME/Ratliff		300						1203	52				360		100								350	2365
Laser Eng/Dillon			363				360			900					100									1723
ENG TOTAL	1462	300	363	400	0	100	360	1933	52	1060	0		360		200	220	0	0	0	0	0	0	800	7610
EE/Peck																360					200	60	731	1351
EE/Sandford				41												140							731	912
*Optics Engr/Kupke										28	480				150						400			1058
EE Tech/Saylor								624	104							240								968
ELE TOTAL	0	0	0	41	0	0	0	624	104	28	480		0		150	740	0	0	0	0	600	60	1462	4289
*Master Optician/Hilyard				378				446								30	48			40				942
Optician Tech/DuPraw		845		0				75					960				112			40				2032
OPT TOTAL	0	845	0	378	0	0	0	521	0	0	0		960		0	30	160	0	0	80	0	0	0	2974
Machinist /Ward		100		496			52	946		80			120							200				1994
Machinist/Pfister		210		496			52	768		80			240			200	80			140		210		2476
FAB TOTAL	0	310	0	992	0	0	104	1714	0	160	0		360		0	200	80	0	0	340	0	210	0	4470
Programmer 5/Deich					32			183	200			731		91									350	1587
Programmer 4/Allen					150				200	80				91		124	350		192		146		350	1683
Programmer 3/Gates								102									790	80			147		350	1469
Programmer 4/Landos					150			180	200					171	100		500	80			147		350	1878
SPG TOTAL	0	0	0	0	332	0	0	465	600	80	0	731	0	353	100	124	1640	160	192	0	440	0	1400	6617
PROJECT TOTAL HRS	1462	1455	363	1811	332	100	464	5257	756	1328	480	731	1680	353	450	1314	1880	160	192	420	1040	270	3662	25960
PROJECT TOTAL FTE	1.00	1.00	0.25	1.24	0.23	0.07	0.32	3.60	0.52	0.91	0.33	0.50	1.15	0.24	0.31	0.90	1.29	0.11	0.13	0.29	0.71	0.18	2.50	17.76

*.75 FTE

KEY
External Funds
UCO Funds

Total available FTE = 15.5 Total FTE programmed 115% Total FTE externally funded 61% Total FTE externally funded (secure) 21%

FTE REPRESENTS EFFECTIVE FTE (TOTAL HOURS / 1462=1.00 FTE)

Cost saving measures

* Operate Lick in "spartan mode" starting in FY14. Gifts of $90 K for FY14.

* Actively marketing technical skills to other Keck instrument labs to increase revenue.

* A cost review is underway at Keck. Money may be redirected to Caltech and UC labs.

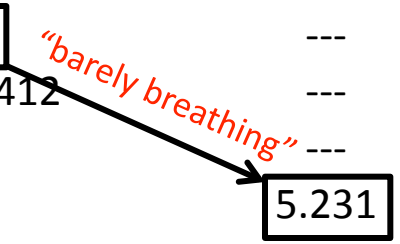
* External review of UCSC administrative group is planned for June. Expected to recommend new accounting and project-tracking software that will cost money in the short run but save in the long run.

* Seventeen sources of revenue examined for Lick public programs. Will expand Summer Visitors viewing and Music of the Spheres.

* UCSC faculty: 4-6 terminations, 2 replacements. Down by 2-4 (20-40% cut).
  - Successful Macintosh hire is essential.
  - Need to institute *systemwide* faculty positions starting in FY14.

FY14 Budget: Base + Prioritized Augmentations

Expenditure	Amount ($M)	Running Total ($M)
Base budget	6.084	---
External revenue range	0.559 - 1.412	---
Adopted external revenue	0.853	---
Base budget minus adopted external revenue *	5.231	5.231
Prioritized augmentations:		
Service buyouts for distributed UCO faculty	0.126	5.357
Debt repayment	0.325	5.682
Lick Observatory long-term plan ↑ mandated	0.070	5.752
Rapid-response astronomy (Keck tertiary mirror)	0.369	6.121
Mega-project management + tracking software	0.250	6.371
Managing director (spring quarter only)	0.040	6.411
TMT science planning allocation	0.020	6.431
Development/communications professional	0.120	6.551
TMT mega-project managers for IRIS and MOBIE	0.240	6.791
Savings for future investments	0.100	6.891



FY14 Budget: Base + Prioritized Augmentations

Salary savings from 4 faculty retirements: $0.968 M

Expenditure	Amount ($M)	Running Total ($M)
Base budget	6.084	---
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Add faculty savings

↑ mandated

Total with everything = $7.548

UCO Faculty Budget for FY14

★ Candidate for distributed faculty?

★ UCLA faculty

Task	Number of Faculty
Instrument PIs:	
★ TMT IRIS	1.00
TMT MOBIE	1.00
Keck KCWI camera + software	0.50
★ Keck NGAO + Shane AO	1.50
Keck deployable tertiary	0.50
★ Keck OSIRIS detector	0.50
★ Keck NIRSPEC detector	0.50
Lick Kast spectrograph detector	0.50
Lick Automated Planet Finder	1.00
Total instrument Pis	**7.00**
★ TMT community management	1.00
★ TMT Science Steering chair	0.50
★ Keck Science Steering chair	0.50
★ UCOAC chair	0.50
★ UC O/IR development chair	1.00
Staff management at UCSC*	2.50
★ Staff management at UCLA	0.25
★ TAC process and scheduling	0.25
★★★ New proposals incentive program	1.50
★ Lick Observatory long term plan	1.00
UCSC Labs Building Committee chair	0.25
★ Miscellaneous and unforeseen^	2.00
Total faculty required	**18.25**

Min. req. @ UCSC 7.25 **Min. req. @ UCLA 2.25**

Part II: Lick Operations in Spartan Mode – Relation to Keck + TMT

Crucial question today: The future of Lick?

The current core budget in FY13:

$2.508 M	Faculty salaries
5.040	Non-faculty items

$7.548 M	Total

“Barely breathing” budget in FY14:

$5.231 M

Crucial question today: The future of Lick?

Scenario	Keck + TMT Instruments	Lick Obs. 5 years	Comments
A: $7.55 M for 5 yrs, incl. Faculty cost	Medium	Yes	Expensive Debt paid from this sum Preserves all options
B: $5.04 M for 5 yrs, no Faculty cost	Wrecked?	Yes	Lose extra $400 K revenue Debt paid from faculty savings Permanent damage
C: $5.04 M for 5 yrs, no Faculty cost	Strong	No	Lose Shane AO: NSF confidence Lose AO lead to Caltech Lose APF: $12 M investment, donor confidence Lose five years of science Debt paid from faculty savings Bad PR Permanent damage

Status of Lick Repurposing Study

* Sandy, Maureen, and John Wareham hosted a visit by Steve Beckwith and ORGS staff to Lick on April 10. It was agreed that both groups would need to be involved in the study and that a division of responsibilities is needed.

* Maureen met with Jenny Gautier April 18? in order to "plan to plan". Maureen will describe the results of that meeting, and next steps.

Status of UCO Faculty Transition

* Existing 11-month appointments cannot be changed to 9-month appointments.

* Money can be shifted from UCOP to UCSC to pay for the 11-month appointments. Should this be as a lump sum (UCOP) or as an ongoing transfer (UCSC)?

* UCSC plan was prepared yesterday based on ongoing transfer.

* Priority sequence: pay increase salary costs, then pay debt, then any excess goes back to UCOP.

* UCO non-faculty expenses would be negotiated separately by Director and UCOP.

Conclusions on Lick

* The staff will evaporate in a matter of weeks unless a firm future is guaranteed.

* Five years of operations would be sufficient to retain the staff.

* Operating Lick plus maintaining a viable instrument capability requires maintaining the total Astronomy commitment at $7.548 M.

Part III: Long Term Vision – 2023 was a Banner Year for UC Astronomy

2023 Was a Banner Year for UC Astronomy and UC

Here are some snippets from news stories about UC astronomy in 2023, all of which happened because of investments in the previous ten years:

* 2023 was the year that the ***Thirty-Meter Telescope*** reached its full aperture, though it had already been the largest telescope in the world since July 2021. The first-light adaptive optics system was working, and the telescope was taking images that were ***10 times sharper and 100 times fainter than Hubble.*** As a result:

- The ***"TMT Ultradeep Field"*** unveiled a new population of ***super-faint early galaxies*** that Hubble had completely missed. Were these real galaxies or simply super-massive star clusters? How had they formed? Theorists were scratching their heads to explain this totally unexpected population.

- AO images of dozens of ***exoplanet solar systems*** in the Taurus Dark Clouds give the first unbiased census of ***how and where planets form***. Forming jupiters were detected all over the Clouds, and ***complete 3-D orbits*** of these young solar systems were being measured. Soon we would know how many forming planets were being ***dynamically ejected*** as youngsters into the cold depths of interstellar space.

2023 Was a Banner Year for UC Astronomy and UC

* More early TMT science:

- Two teams were gearing up to observe an ***Earth-mass gas cloud*** that had recently been spotted en route towards the black hole at the Galactic Center. The hope was that some of the gas would fall in and activate a ***mini-quasar***, the first such event that had ever been seen.

- The exquisite resolution of TMT revealed huge numbers of ***mini-gravitational lenses*** in galaxies produced by thousands of tiny, ***invisible, dark-matter satellites.*** Theorists had predicted this population, but it had never been seen before. Early properties of the lenses agreed well with the dark-matter particle produced at the Large Hadron Collider in 2018.

- Perhaps the most surprising result from the first year of TMT was the ***complete absence of quasars*** (accreting black holes) before a redshift of 9.5. Theorists had predicted hundreds of these objects, yet none were found. Quasar black holes **AT** 9.5 had typically many millions of solar masses, but ***just before that, nothing.*** Theorists were puzzling over how the sudden turn-on of quasars had happened, and what it meant. Quasars had outsmarted astronomers once again.

2023 Was a Banner Year for UC Astronomy and UC

* Thanks to leadership by UCO, Keck Observatory had completed installation of its ***Next-Generation Adaptive Optics*** system in 2019. The system was routinely realizing three times sharper resolution than Hubble and was the AO system that finally convinced the astronomical world that the ***future of sharp imaging is on the ground,*** not in space. More than ever before, Keck became an ***imaging machine,*** and the fabulous images it produced garnered an outpouring of public admiration and support for ***"California's telescopes".*** Keck was now a household word, and select donor groups were paying ***$1 M per night*** to look directly with their eyes through the telescope at Keck's AO-sharpened images.

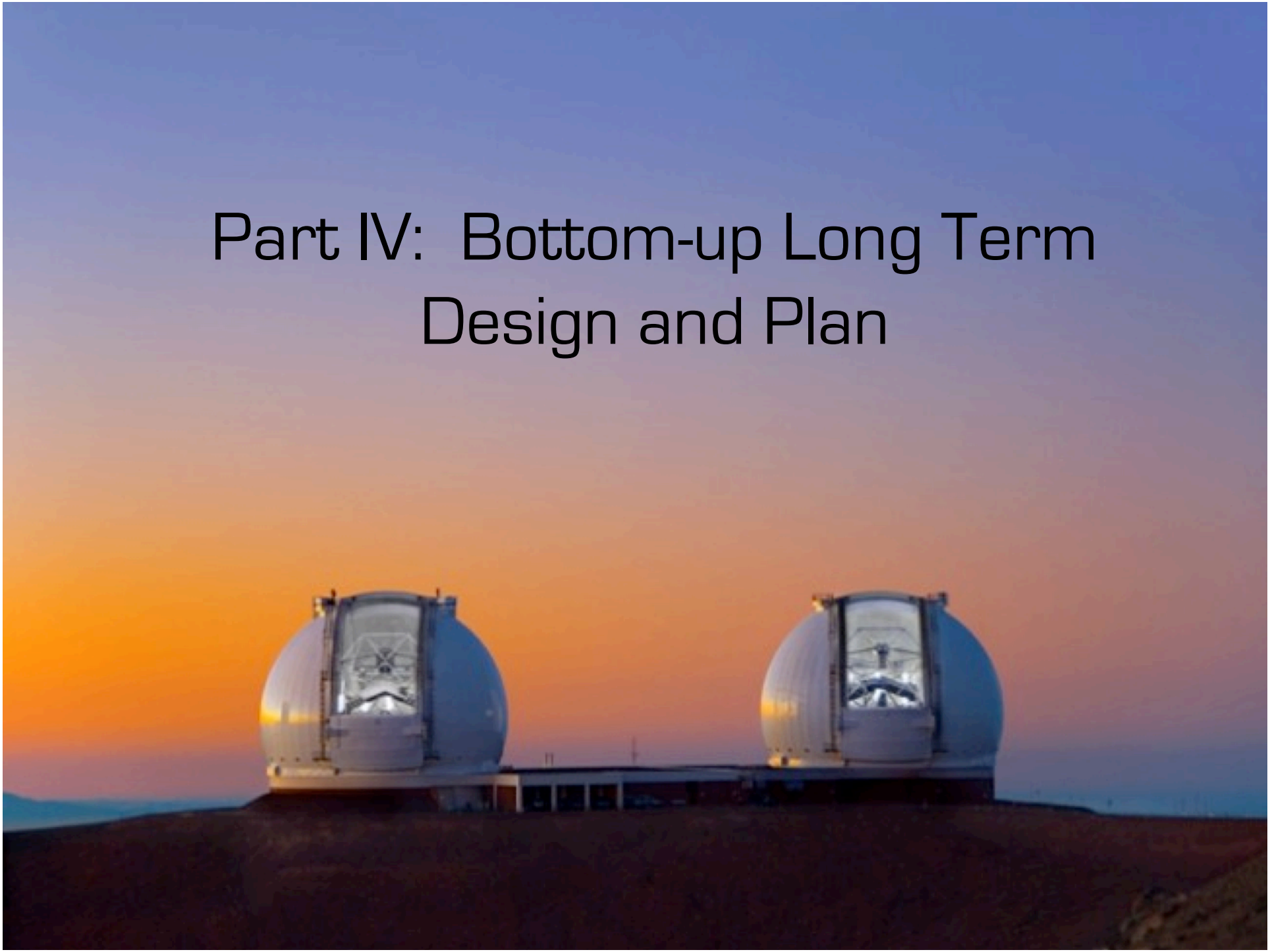
* TMT was even better known than Keck to a ***whole generation of California schoolchildren***, who had received ***updates about TMT every year*** as construction unfolded. Starting in 2015, TMT had been used to teach not only obvious stuff about astronomy, optics, physics, planetary science, and exobiology but also mechanical and electrical engineering, environmental science, project management, and government relations. The ***life stories of TMT scientists and employees*** were used to introduce California school children to people from around the Pacific Basin and open their eyes to the ***myriad opportunities in stem careers***.

2023 Was a Banner Year for UC Astronomy and UC

* A whole year of festivities climaxed on April 12, 2023, which marked ***the 100th anniversary of the first confirmation of Einstein's theory of General Relativity*** by Lick astronomers W W Campbell and Robert Trumpler in 1923. Commemorative events had started in 2015, the 100th birthday of the theory. Thousands of scientists attended a symposium in downtown San Francisco charting the achievements of the GR theory over the past 100 years, culminating with brand-new dramatic evidence from TMT of GR effects on the orbits of stars around the black hole at the Galactic Center. Thousands of ordinary citizens attended a massive day-long tutorial on the nature of space-time and gravity. Modules and lectures on GR and UC's role in proving it were prepared and distributed to high school and undergraduate Physics teachers throughout the state.

* The GR festivities were organized by the new ***James Lick Foundation***, a private foundation that took over operations of Lick Observatory in 2018. The JLF had joined the Kitt Peak and Mount Wilson Foundations in 2019 to form a tripartite destination for ***astro-tourism***. A private development corporation rebuilt the historic Lick dorm, and 100 people per night were viewing staying at the ***bed and breakfast*** and viewing through the 36-inch refractor and the Shane 3-m. Total revenues were approaching ***$2 M/yr***.

Part IV: Bottom-up Long Term Design and Plan



Functions of UCO relative to Keck (and TMT)

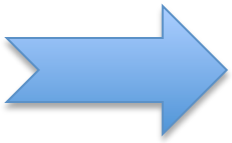
- **UCO and Caltech run Keck.** We set the priorities, approve the budget, review the Director, and oversee the quality of the work being done. We are in charge.
- **We build the instruments** that go on the telescope and provide support services to fix them when they break. We build the upgrades that keep the instruments at the cutting edge over time. We provide a pool of technical expertise for emergencies.
  - Instruments need upgrades or replacement roughly every 5-10 years.
  - There are 9 regularly used instruments on Keck.
- We develop **new technologies of the future** (e.g., Next Generation AO, $50 M).
- We initiate and approve **other sources of Keck revenue**, such as the sale of telescope time. Such revenue is used for instrument funds and for major telescope repairs.
- We garner **new resources** by writing grants, participating in Keck-led fund-raising events, and through our campus development offices.
- UCO operates the **time-award process for UC astronomers** and oversees the scheduling process.
- We **represent and defend Keck interests** to external bodies (UCO Board, NSF, Astronomy Decadal Surveys, etc.)

Long Term Technical Staff

	Lead	Core	Major Project
Assoc. Dir. Advanced Technologies	1		
Groups:			
Systems engineering	1		1
Opto-mechanical engineering	1		1
Mechanical engineering	1	2	1-2
Electrical engineering	1	1	1
Software: controls and data	1	2	2
Totals	6	5	6-8
Current	11		

Group leaders: a new type of technical employee we currently do not have

* Higher skills
* Vision, initiation, planning
* Management ability
* Communication skills



* Proposal initiation
* Proposal execution

Long Term Administrative Staff

	Core	Major Project
Managing Director	1	
Business manager	1	
Accountant	1	1
Analyst	1	
Buyer	1	1
HR	1	
Admin assistants: Director, tech grp	2	0.5
Development, publicity	1	
Web, graphics, archivist, reports	1	
Totals	10	2.5
Current	10.5	

Differences:

* Managing director with astronomy PhD >> problem solver, special projects
* Development
* Communications

Long term faculty budget looks much like FY14

★ Candidate for distributed faculty?

★ UCLA faculty

Task	Number of Faculty
Instrument PIs:	
★ TMT IRIS	1.00
TMT MOBIE	1.00
Keck KCWI camera + software	0.50
★ Keck NGAO + Shane AO	1.50
Keck deployable tertiary	0.50
★ Keck OSIRIS detector	0.50
★ Keck NIRSPEC detector	0.50
Lick Kast spectrograph detector	0.50
Lick Automated Planet Finder	1.00
Total instrument Pis	**7.00**
★ TMT community management	1.00
★ TMT Science Steering chair	0.50
★ Keck Science Steering chair	0.50
★ UCOAC chair	0.50
★ UC O/IR development chair	1.00
Staff management at UCSC*	2.50
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★ TAC process and scheduling	0.25
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★ Lick Observatory long term plan	1.00
UCSC Labs Building Committee chair	0.25
★ Miscellaneous and unforeseen^	2.00
Total faculty required	**18.25**

Min. req. @ UCSC 7.25 **Min. req. @ UCLA 2.25**

Models for physical locations for UCO

Assume that UC is building instrumentation for Keck and supporting Keck in other ways but no longer operates Lick. Keck is the new "mountain top" for UCO.

All in one place: "mountain top" model >> Instrument staff close to telescopes

* Never done, no examples
* Too out of the way; staff do not like living there
* **Astronomers lose visibility and control**
* **Far from faculty and students**

All in one place: "downtown" model >> Nearest urban area or university

* Most common: National Optical Astronomy Observatory, McDonald Observatory, Steward Observatory, Institute for Astronomy (UH)
* Advantages:
  - Provides an administrative center
  - Assembles critical technical mass in one place
  - Projects can share costly technical facilities (e.g., CNC)
  - Share brainpower
  - Flexibility to move staff across projects
  - Close to faculty and students

Models for physical locations for UCO, cont'd

Highly distributed: "multi-centers" model >> Multiple technical centers widely distributed.

* Getting more common: European Southern Observatory, Magellan Observatory, Keck (if Caltech is included), Giant Magellan Telescope, TMT
* Where used: large collaborations in which each partner has its own independent technical group
* Disadvantages: complex management, difficult quality control
* Advantages: maximizes technical and financial resources to project, incentivizes partners
* ONLY FEASIBLE FOR LARGE COLLABORATIONS. UC NOT LARGE ENOUGH.

Optimum UCO model and locations

Optimum UC model: "downtown" model with UCSC headquarters + one satellite lab at UCLA

* UCSC will be more project-driven than before.
* UCLA will receive a larger share of foundational funding from UCOP.

>> CONVERGENCE IN TECH STAFF AND FUNDING; RATIO 2:1.

* Fraction of technical funding from external sources in both groups: 30%
* Advantages:
  - Still have an administrative center
  - Creates two major critical technical masses
  - Projects can share costly technical facilities (e.g., CNC)
  - Share brainpower
  - Flexibility to move staff across projects
  - Close to faculty and students

Additional advantages of two centers:

- A second well defined focus on IR
- Increased total faculty expertise
- Exploits UCLA campus investment in UC O/IR astronomy
- Doubles teaching and training opportunities

Model *could* expand to more campuses, but only if more resources identified:
Faculty, technical facilities, technical staff.

UCO budget does not need to grow over long term

	FY13		Long term
Faculty	$2.54 M	dn →	$0.63 M*
Director	----		0.30
Managing director	----		0.20
Business & admin support			
Lick	0.44	dn →	0.10
Other	0.66		0.65
Lick Observatory staff	1.03	dn →	0.25
Instrument & technical staff			
Lick	0.42	dn →	0.10
Keck + TMT	1.58	up →	3.30
UCLA	0.30	up →	0.70
Development, publicity, outreach	----		0.32
Non-salary expenses	0.60		0.80
Capital investment, savings	----	up →	0.50
Totals	$7.57 M		$7.85 M

* *Provision for 14 UCO faculty, 7 at UCSC, 7 around system. Cost on UCO budget is $45 K per faculty for 2 teaching buyouts and 1 month of summer salary.*

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STRATEGY: Shift $3.1 M from faculty and Lick to Keck, TMT, and savings.

CONCLUDE: Long term UCO budget envelope can remain ~ constant.

Part V: Backup slides

Dorr Assumptions for UC O/IR Astronomy

* UCO is committed to operating within its budget this year and every year thereafter;
  - Yes. Depends on knowing what the budget is in a timely way.

* Ultimately, UCO will have no faculty hired permanently on UCO funds wherever these funds are lodged in UCSC;
  - Yes.

* There will be no permanent commitments of UCO funds to any faculty member;
  - Yes.

* There will be no more one-time funding increments for UCO.
  - Yes.

* UCO[1]s long term future funding will be based on a variety of recommendations and circumstances that are still being formulated;
  - In principle, yes. But Lick decision today requires long-term budget commitment.

* UCO is committed to paying off its debt;
  - Yes. Amount and payment schedule are TBD.

Dorr Assumptions for UC O/IR Astronomy

* UCO[1]s funding from UCOP for FY 2013-14 will not be greater than it is this year, FY 2012-13, and it could be less;
  - UCO has submitted a zero-based budget and awaits action on it.
  - FY14 is viable if investment remains constant at $7.548 M.

* UCO at some point in the future (but not for years to come based on the spread sheet we received) will have some level of funding that can be used to support faculty engagement with specific and time-limited (renewable) UCO responsibilities;
  - No, this new funding category is needed **in FY14** to initiate the new program of systemwide UCO faculty positions. We ask for $135 K, equivalent to 3 full-time faculty.

* This level of funding will definitely be less than that currently used to support 10.6 permanent UCO faculty FTE;
  - Yes. Current budget for 13 faculty is $2.5 M. Ultimate budget is ~$650 K for 14 faculty.

* The funding level will be separately negotiated based on UCO proposals rather than acquired by retaining funds freed up by retirement or resignation of current UCO faculty;
  - No. "Proposal" idea is not viable. First, many faculty are supported by these funds are on ***long-term*** programs -- stable support is needed. Second, many jobs are not "projects" that fit into "proposals". Third, the new Director would not agree to re-negotiating faculty manpower on a frequent basis.

Recent good news

* TMT update:
  - The partnership Master Agreement has been agreed to by the Collaborative Board. Scientific Authorities signoff in July. Financial Authority signoff in Winter 2014.
  - Limited Liability Company partnership agreement near completion.
  - Decision on "early money": 4% interest rate, since 2004.
  - Decision to use "world book" costs. Lessens project cost growth.
  - Decision to require 31.2% cash per partner, 69.8% in-kind.
  - UC has 12.3% observing share; $125 M Moore gift, $50 M to be raised; $4.9 M annual operating costs (FY2011 dollars).
  - Yale selected TMT (over GMT) at 5% share; Japan has committed $17 M; India has committed at press release level; Canada process going well; Yang got to Madame Liu in China.
  - NSF is funding $250 K/yr to engage US astronomical community.

* Two UC astronomers won Sloan Fellowships: Naveen Reddy (UCR) and Charlie Conroy (UCSC). Mark Krumholz (UCSC) won Warner Prize for best early-career US astronomer.

* Bruce Macintosh obtained first emission spectrum of extrasolar jupiter-like planet. Found water and carbon dioxide. Implies that planet accreted atmosphere around a rocky core. TMT will find hundreds of these. Offer is out to Macintosh at UCSC.

Astronomy is not more expensive than other sciences

From: UC Investment in Astronomy vs. Other Sciences, by J. P. Brodie and S. M. Faber, April 2013

Table 1
UC State Funds Invested per UC Scientist

	Astronomer	Laboratory Scientist
(a) Capital costs	$0.93 M	$1.74 M
(b) Start-up	0.34	1.63
(c) Operations over 30 yr	3.00	0.84
Lifetime total (a+b+c)	$4.27 M	$4.21 M

Adding TMT does not markedly change the picture

From: UC Investment in Astronomy vs. Other Sciences, by J. P. Brodie and S. M. Faber, April 2013

Table 1
UC State Funds Invested per UC Astronomer

	Keck only	Keck + TMT
(a) Capital costs	$0.93 M	$0.93 + 0.00
(b) Start-up	0.34	$0.34 + 0.00
(c) Operations over 30 yr	3.00	4.69*
Lifetime total (a+b+c)	$4.27 M	$5.95 M

*Annual UC operating costs adding it TMT (in 2012 dollars):

Keck	$ 6.34 M/yr	
TMT	4.90	Spread over 120 observers is $0.156 K/yr per observer.
UCO	7.50	Currently is $0.100 K/yr for 75 Keck observers.
Total	$18.74 M/yr	

Off-site costs vs. total costs of Lick Observatory in FY14

Additional savings that would be realized from shutting down all UCOP-funded project activities and removing all UCO Instrument Labs tech support:

UCO Labs technical support:	$231 k (in budget)
Shane aluminizing:	20 k (estimated)
Research scientist support time:	258 k (in budget)
Construction and commissioning of Shane AO system:	63 k (in budget)
Administrative support (2.6 FTE):	300 k (in budget)
Total off-site	$872 k

Total cost of Lick in FY14 = $1.04 M (on site)
(UCOP funds only) 0.87 M (off site)

Total $1.91 M ===> $2.8 M

Not included is UCSC maint+util ($640 k) or faculty time ($60 k)

Spartan Model for Lick Operations: Assumptions

- UCSC keeps maintenance funding at ~$490 k/yr
- Support from UCO Labs is capped at $231 k for software, optics maintenance, and instrument techs (at least $500 k less than in previous years).
- Additional expected cost not yet factored in: aluminizing 3-m mirror (10 man weeks = $20 k)
- Not included in the definition of “operations”:
  - UCO faculty and research scientist support time
  - Construction and commissioning of Shane AO system and new Shane AO laser
  - Commissioning of Automated Planet Finder telescope

Major Keck Instruments and Upgrades from UC

2012 MOSFIRE IR spectrograph: Caltech & UCLA Co-PIs, UCSC (optics and guider)
2010 LRIS-Red detector upgrade: UCSC PI
2007 LRIS atmospheric dispersion compensator: UCSC PI
2005 OSIRIS IR spectrograph: UCLA PI
2004 Keck-II laser guide star: LLNL & UCSC Co-PIs
2004 HIRES detector upgrade: UCSC PI
2002 DEIMOS optical spectrograph: UCSC PI
2001 NIRC-2 IR camera: Caltech PI, UCLA (electronics)
1999 NIRSPEC IR spectrograph: UCLA PI
1999 ESI optical spectrograph: UCSC PI
1997 HIRES image rotator: UCSD PI
1994 HIRES optical spectrograph: UCSC PI
1993 LRIS-Red optical spectrograph: Caltech PI, UCSC (optics)

Under construction:

KCWI-Blue spectrograph: Caltech PI, UCSC (optics, camera, software)

Proposals submitted:

NIRSPEC detector upgrade: UCLA PI
OSIRIS detector upgrade: UCLA PI
Keck I deployable tertiary: UCSC PI

Five-year horizon: Next Generation Adaptive Optics ($50M), KCWI-Red spectrograph

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UCSC

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Optical instrument

Optical upgrade

Infrared instrument

Infrared upgrade

Under construction:

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Roles and responsibilities of UCO faculty

Faculty Roles in Managing and Operating the University of California Observatories

S. M. Faber, Interim Director

May 2013

Summary

This document describes the current roles and responsibilities of UCO faculty members in running the University of California Observatories, with particular focus on their functions in UCO management and relationships to UCO staff. Faculty carry out ten different functions in running UCO, many of which also involve staff. Staff relations are of two types: supervisory and collaborative. All research scientists and staff heads of work groups have faculty supervisors. Through their roles in setting strategy and policies and direct supervision of research scientists and staff, UCO faculty provide the basic guidance for steering and managing the Observatories.

Roles and responsibilities of UCO faculty

1) Set overall goals and policies for UCO
2) Represent UC O/IR interests within UC and to external partners and communities
3) Provide policies and high-level supervision for staff
4) Oversee and manage access to Keck, Lick, and TMT
5) Initiate, plan, and execute instrument construction for Keck, Lick, and TMT
6) Develop astronomical technologies of the future
7) Initiate, oversee, and participate in education and outreach.
8) Initiate, oversee, and participate in development and fund-raising
9) Support and promote teaching and training
10) Assist the Director in special projects

Roles and responsibilities of UCO faculty

Excerpt from table:

Faculty member	Nature of role	Relation to staff
Rebecca Bernstein	Supervisory	As PI of MOBIE spectrograph, supervises Research Scientist Bruce Bigelow, MOBIE's chief engineer.
	Collaborative	As PI of MOBIE, collaborates with MOBIE design team.
	Collaborative	Co-chair of internal UCO strategic planning committee. Plans collaboratively with staff to define elements of new strategic plan.
	Collaborative	Co-chair of UCO Instrument Laboratory building committee. Plans collaboratively with staff to design new labs building.
Jean Brodie	Collaborative	Faculty co-lead (with Koo) for UCO communications, website, Lick Newsletter, Annual Report. Works with staff to prepare articles, gather facts and data for reports, design and manage UCO websites.
Mike Bolte	Supervisory	Supervises Research Scientist Andrew Phillips (who heads the Advanced Astronomical Coatings Laboratory).
	Collaborative	As Coatings Lab faculty supervisor, works with Coating Lab staff to define directions and write grant proposals.
Harland Epps	Collaborative	PI for camera optics fabrication for Keck KCWI spectrograph. Works with camera optics fabrication team to polish lenses and design and procure lens coatings.
Sandra Faber	Supervisory	As UCO Interim Director, supervises all groups and research scientists.
	Supervisory	Direct supervisor for the Administrative and Business Services group.
	Collaborative	Engages with a broad array of staff to set priorities, solve problems, and keep the place running.

The UCLA IR Lab

Ian McLean, James Larkin & Mike Fitzgerald

- The IR Lab is focused on one task, building infrared instruments, mostly one at a time, but often with overlapping projects for sustainability. The IR Lab is not engaged in other types of technology development or observatory operations.
- World-class astronomical groups rely on having talented and experienced people who are deeply familiar with their technical environment. Efficiency is impossible if technical staff are constantly turning over.
- The capital cost of establishing the IR Lab in 1989 was funded by UCLA. We continue to receive support from UCLA through standard subsidies and services available to all academic personnel. For example,
  - UCLA accounting services are provided without charge because the three faculty involved are standard 9-month academic employees and infrared instrumentation constitutes their research.
  - Shop charges are based on the same subsidized rate for all UCLA faculty.
- Otherwise, our operations model is based on "cost for technical services." It costs about $900K per year to maintain the current IR Lab staff level.
  - This includes 8 professional staff (our core minimum) and several graduate students.
  - Of this total, ~$300K comes from UCO, and the rest from contracts and grants.
  - UCO funding is directed to the maintenance of professional services, business administration, IT support, health & safety, infrastructure, personnel training and travel. These are important attributes of a successful lab.
  - Summer salary support for the faculty involved comes from a combination of grant funds and some UCO funds.

The UCLA IR Lab and UCO

- Contracts for the construction of instruments such as MOSFIRE (Keck), GPI (Gemini), FLITECAM (SOFIA), IRIS (TMT) and others, cover remaining costs.
- Sometimes, the external funds enable the IR Lab to increase our staff levels. Our peak level of 13 staff occurred in 2007.
- The UCLA IR Lab has long recognized the value of partnerships with similar-sized groups at other institutions.
  - We began advocating this approach with our first Keck instrument (NIRSPEC, 1999) in which we collaborated with UCB. The same solution was adopted with NIRC2, OSIRIS and MOSFIRE. We routinely collaborate with Caltech and other UCs, and we have developed the expertise to collaborate with international groups (TMT/IRIS).
- Ideally, to be a *true* partner in UCO, our core group of eight people should be supported 100% by UCO funds. In such a model, the expertise of the core group would never be at risk, as it is now.
  - Our core group consists of 1 systems engineer, 2 mechanical engineers, 1 mechanical technician, 1 electronics technician, 1 senior programmer, 1 IT person and 1 administrative assistant.
  - We also need support for graduate student trainees; we have been very successful in integrating graduate students into our program.
  - Full support would provide the free energy needed for proposal development
- At the very least, future UCO support at the 50% (instead of the 33%) level would be extremely beneficial because it would enable the IR Lab to hire a top-quality person *now*, in readiness for TMT.

Part VI: Jan 30 Recommendations

Summary of UCO Recommendations

- *Recommend 1:* Endorse UC's commitment to the Thirty-Meter Telescope and support ongoing negotiations with partner institutions.

- *Recommend 2:* Endorse plan to redirect Keck savings after 2018 to pay TMT operating costs.

- *Recommend 3:* Support Lick operations for 5 years at spartan levels while plans are developed for 2018 and beyond.

- *Recommend 4:* Redirect some fraction of technical effort from Lick to Keck instrumentation by operating Lick in spartan mode for next 5 years. Details in Feb.

- *Recommend 5*: Set aside the first two retirement positions for the Director and an ***Assoc. Director of Adaptive Optics,*** with permission to start the hiring process immediately.

Summary of UCO Recommendations, cont'd

- *Recommend 6:* Advise UCOP that current MRU definition is unsuitable for UCO. Request a TBD committee to work with current UCO administration to craft new words and new MOU with completion date Jan. 1, 2014.

- *Recommend 7:* Advise UCOP that Director search should be initiated in Fall 2013 in anticipation of final MRU/MOU. Director should be appointed by UC President or designee with review and approval by the UCSC Chancellor. Request that UCO and UCSC administration draft a position description, compensation plan, and a performance review process for presentation at next Board meeting.

- *Recommend 8*: Apply faculty savings to repay the UCO debt.

- *Recommend 9:* Include TMT instrument building in long-term Core model.