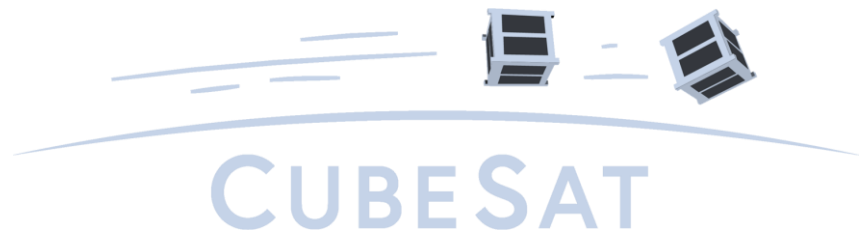# CubeSat Developers Workshop

CubeSats for Capacity Building - Efforts undertaken at Cal Poly
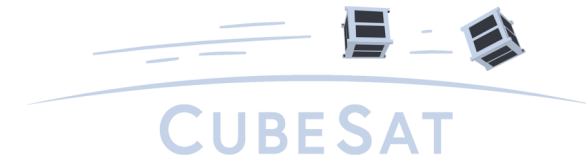
April 23-25, 2019

Pauline Faure – pfaure@calpoly.edu
(≈ For/Four)

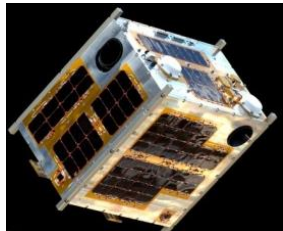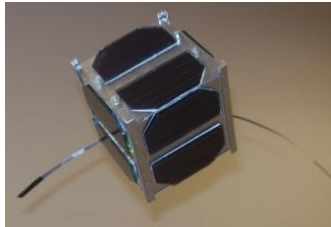Pauline Faure – pfaure@calpoly.edu

CubeSats Evolution

- Non-traditional satellites are not defined by their size or volume, but by their <u>non-traditional and risk taking development approaches</u>

- **Development drivers -** fast delivery, low cost, value

New comers, universities

Private sector, space agencies

DIWATA (Philippines)

Chasqui – UNI (Peru)
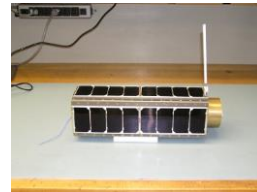
NEE-01 Pegaso - Ecuadorian Space Agency (Ecuador)

Pico Dragon - VNSC (Vietnam)

GeneSat-1 - NASA/Santa Clara University (U.S.A.)
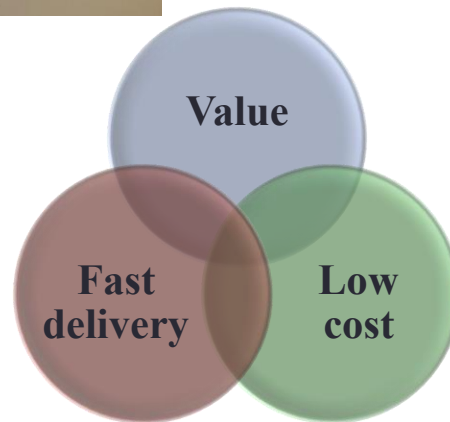
KNACKSAT – KMUTNB (Thailand)

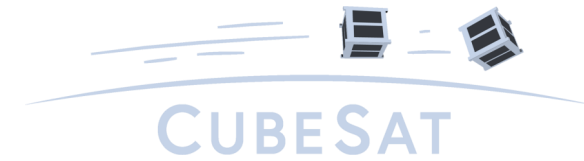CubeBug-2 - Satellogic (Argentina)
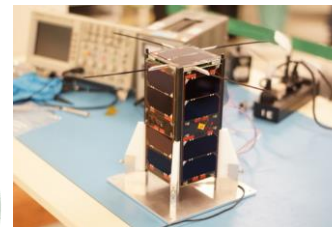
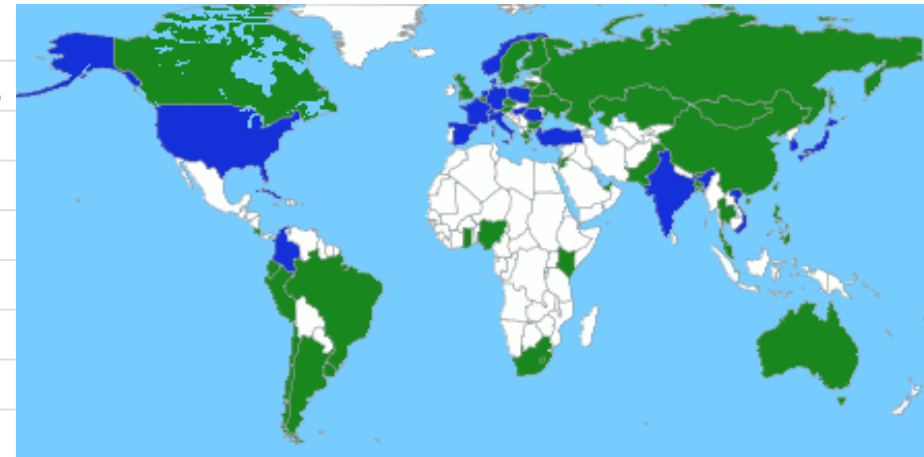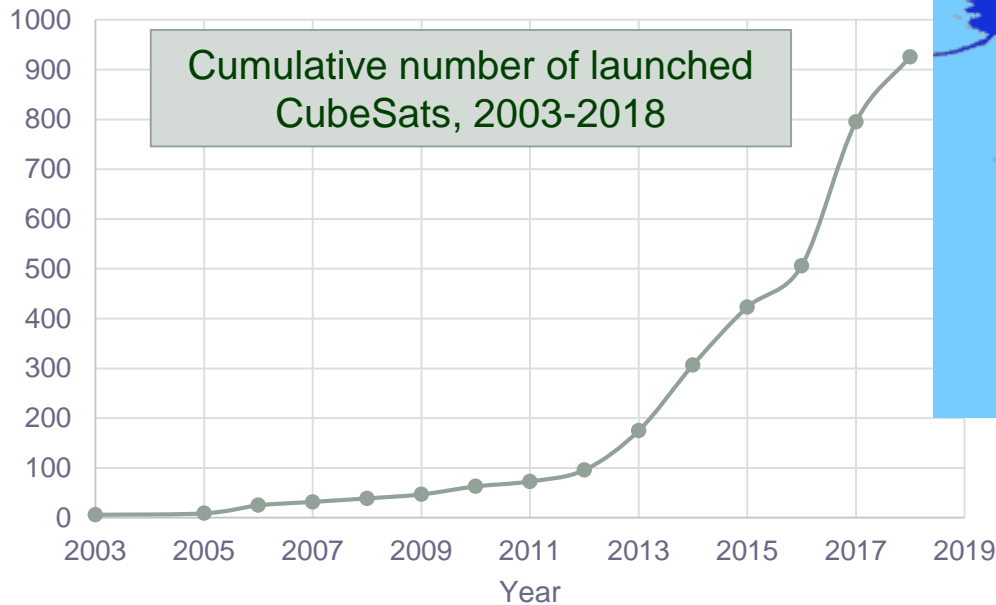Dove2 – Planet Labs (U.S.)

Arkyd 3 - Planetary Resources

Value

Fast delivery

Low cost

CubeSats Evolution

- Trends of CubeSats

Countries having launched a CubeSat
2003-2012 (blue), 2013-2018 (green)

Cumulative number of launched
CubeSats, 2003-2018

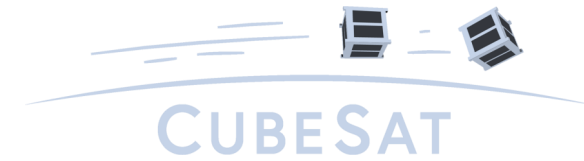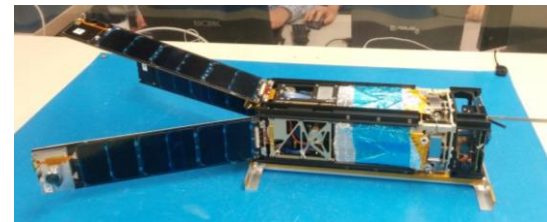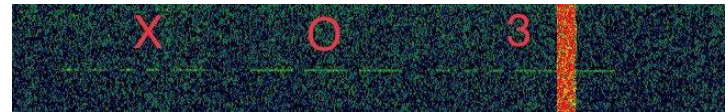**2003-2012 | 15 countries**
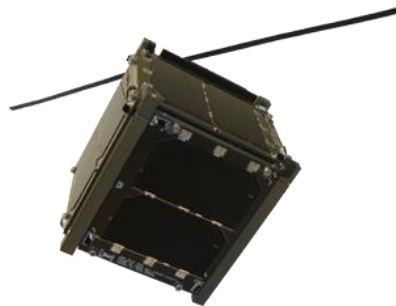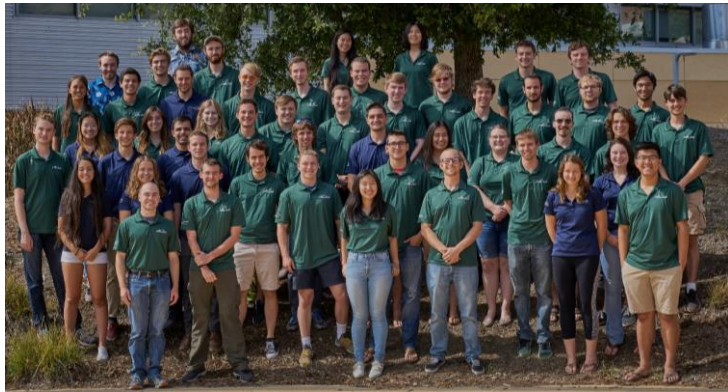**2013-2018 | 59 countries** (x4!!)

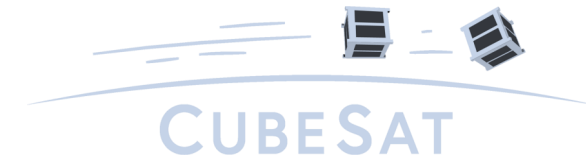Graphics generated using data from nanosats.eu

CubeSats at Cal Poly

- Laboratory established 20 years ago

- 500+ students trained-by-doing

- 90% undergraduates, 10% graduates

Capacity Building at Cal Poly

Effort 1 – Training course for new CubeSat developers

- **1st edition -** 35+ participants

- Higher level description of CubeSat development processes
  - ➢ CubeSat subsystems and functions
  - ➢ CubeSat mission selection
  - ➢ CubeSat project management
  - ➢ CubeSat testing

- **Training in the future**
  - ➢ One week intensive course
  - ➢ Specialized training

Cal Poly CubeSat Training
April 26 - 27, 2019

Are you a new CubeSat developer or would like to become one?
Do you wonder how to make your CubeSat successful?
Would you like to learn from peers on what not to do?

YOU'LL TACKLE TOPICS ON:

FOUNDATION
Design Complexity vs. Simplicity
CubeSat Lessons Learned
Mission Definition

DESIGN & TEST
Ground Segment and Software
CubeSat Parts and Functions
Testing

LOGISTICS
CubeSat Design for Safety
Launch Opportunities
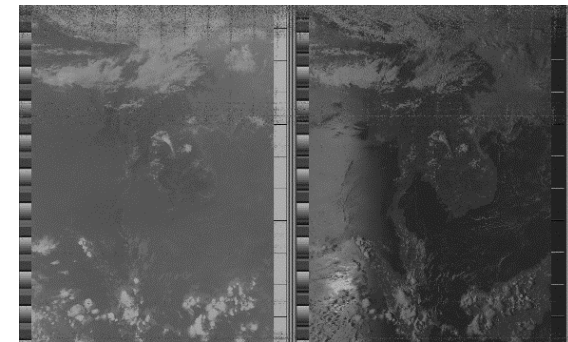Licensing

Capacity Building at Cal Poly
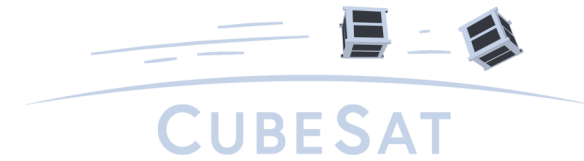
Effort 2 – Support emerging space faring nations

- Ground station development

- Mission concept to implementation

- CubeSat development, integration, testing, and operations
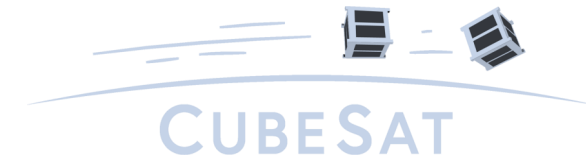
- **Case in point** - Cambodia

http://ligercubesat.org/

1st image acquisition from NOAA 19
by Liger preliminary GS
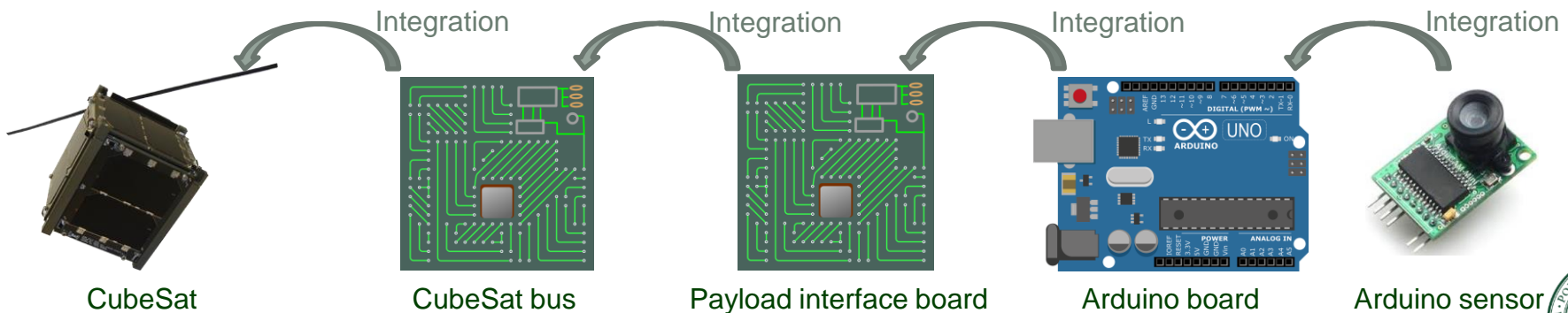
Capacity Building at Cal Poly

Effort 3 – Tools and processes to facilitate access to space

- Encourage use of how to and lessons learned databases
- Interactive CubeSat mission planning
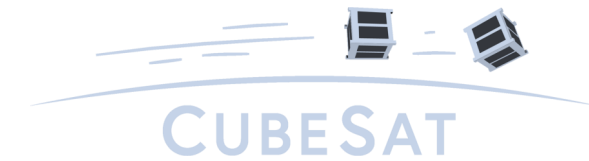- Flexible payload interface development

Illustration of mission planning tool

| **Input** Payload requirements – Power consumption, size, deployable structures, etc. | → | Mission planning tool | → | **Output** CubeSat characteristics – Form factor, schedule, ROM cost, etc. |

Illustration of flexible payload interface

Integration   Integration   Integration   Integration

CubeSat   CubeSat bus   Payload interface board   Arduino board   Arduino sensor

Final Words

Fly by doing - Facilitating and enhancing access to space for all
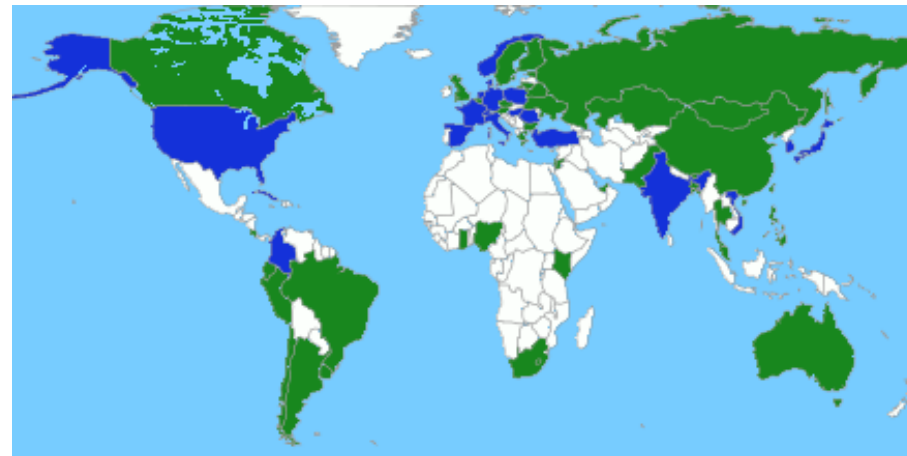
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