

QuarkNet Advisory Board Report

7 December, 2019

Advisory Board (AB) members present: Ken Bloom (remote), Aaron Dominguez, Elisa Gatz, Steve Goldfarb, Reinhard Schwienhorst

Quarknet collaborators in attendance during presentations: Marge Bardeen, Ken Cecire, Joel Griffith, Tom McCauley, Deborah Roudebush, Morris Swartz, Mitch Wayne, Mark Adams, Dave Hoppert, Kathryn Race, Jeremy Smith, Joel Griffith, Shane Wood, Angela Fava (remote), Becky Thompson (afternoon)

Reports from QuarkNet

- Quarknet had a meeting last two days, which fits well.

Agenda: <https://quarknet.org/content/quarknet-advisory-board-meeting-2019>

Intro

- Every center has been in place for at least 3 years.
- New 5 year award started Sep 1, 2018.
- Previous 5-year program had a no-cost extension, so this past summer had overlap.

Neutrino Studies

- Minerva masterclass now has a web page - new for 2020
- Microboone masterclass - focus on instrumentation
- Question to AB: engaging more neutrino people. Masterclasses can be held anywhere, how can we grow the number of people participating in that?
 - Have a person leading the MicroBoone Masterclass effort
 - Would like more people to run the Minerva Masterclass
 - No Nova masterclass available. Even if it gets built, it will take a year before it would go online.
 - Minerva Masterclass is available for international use, but led at Fermilab.
 - One idea: At appropriate meetings, teach people how to run Masterclasses (like was done at last IPPOG meeting, <http://ippog.org/>)

Cosmic Rays

- 7 cosmic ray workshops this last summer, work with 65 students
- Correlation of cosmic rays vs pressure - asynchronous, then extract correlations
- MUSE - several presentations by students at upcoming AAPT meeting
- Publications - main process is presentations at conferences (AAPT and cosmic ray conference) - few journal papers (one from 2018 still in review)

- Muography - if funded, then build next year, then test on Fermilab High Rise, then go to Mexico in 3 years. CSU is Chicago State, African-American majority institution.
- G-2 experiment would use a magnet and updated detectors to measure it in cosmic rays. Fermilab g-2 might get interested in this effort.
- Licensing of DAQs: these numbers are counts outside of Quarknet program
 - Within Quarknet program there are about 300 detectors
- Is it possible to deploy cosmic ray detectors in all schools?
 - Need it to be simpler, cheaper, and also limited by demand
 - Current model would cost about \$3,500 each
 - Other funding sources?
 - There is a \$100 cosmic ray detector (cosmic ray watch), but exploring this would require someone to ask Fermilab for funding. - Otherwise ask for new grant - in next cycle.
 - This was also discussed last year - even though cheap detectors are much simpler, could still advertise them as a startup option that does just muon counting and could support simple experiments.

LHC masterclasses

- Other LHC experiments, LHCb and ALICE? Not many LHCb institutes in US, and Quarknet is supported by CMS and ATLAS. Masterclasses exist for both, but there are no experts at Fermilab or within Quarknet to run workshops.
- Mechanism for feedback from Masterclasses - for CMS it comes back to Ken, and Ken also has a close connection to Uta for the ATLAS Masterclass.
- Simplifying Masterclasses as much as possible to make them more attractive to use? - This is what WorldWide DataDay was designed for (happens at the HS), as opposed to Masterclass, which happens at University or National Lab.

Data Portfolio - name is now "Data Activities Portfolio"

- Enduring understanding - eg "importance of thinking about and dealing with uncertainties in experimentation" - there are 15 of these. Each activity is tied to one of these.
- Levels update - Level 0 is for those teachers who don't have much of a physics background and want a basic tools and skills start in order to feel comfortable doing level 1 activity.
- No level 4 activities yet, but schools that have a cosmic ray detector have several level 4 activities available. - Not yet possible to have level 4 activity (ask your own question and then do some programming to answer it) without cosmic ray detectors.
- Usage of these outside of QuarkNet? - see question of feedback above.
 - Leaving comment requires logging in - but can also send a message through "contact us" - could ask for comments at the end of each activity.
 - Quark workbench has been adopted and adjusted by teachers outside of QuarkNet.

- Concern about PDF on web pages not being accessible? If blind, cannot read PDF, but google would be ok. Be aware that this might become an issue. There are people who sue Universities for not having accessible web pages due to presence of PDF files.

Data camp

- Fewer than half of teachers who participated had physics degree, even fewer had advanced degree.
- Critical mass? Need larger number for effectiveness, groups of 4 working on 6 different tasks, so 24 is a good number.
- Many teachers (even from completely different school settings) have similar questions
- Advertised through Quarknet mentors and in Friday Flyer.
- Could use this as a recruiting tool, invite specific teachers directly (eg those who have been involved with Fermilab in the past, or through step-up program)
 - Reserve a few spots for recruitment
 - Official invitation to specific teachers to try to recruit them
 - Consider allowing people to apply from outside of quarknet
- Neutrino data camp - Minerva masterclass not sufficiently challenging, would require some work to make this useful, but there is potential there.

IT

- Interfacing to google map API required a credit card - so far not charged.
- Servers owned by Notre Dame, new servers donated by ND CMS group.
- Prioritizing tasks
 - could reserve some time each year to work on important but not urgent projects
 - Or find a student intern who could work on tasks that are not emergencies but important?
- ATLAS open data set at 13 TeV also in the process of becoming public (<http://opendata.atlas.cern>)

Funding and budget

- Congratulations to managing the budget so well and being under budget!
- IDC for NSF grant is special rate of 30%, and matching from ND is almost \$100k per year.
- Student support at ND and Fermilab, JHU supports workshops from other funding sources.
- Discrepancy between ATLAS and CMS? In part because ND and Mitch are on CMS and more CMS than ATLAS centers on Quarknet.

Evaluation

- So far 265 survey responses to the teacher survey, great response rate, about 80%.
 - Takes about 18 minutes to complete the survey

- Survey is done once, but one question to each teacher is: can we follow up with you? May do that with some of the teachers, though a short request or classroom observation or other.
- Center survey being updated after pilot run.

Step Up and Broader Impacts

- Co-sponsored by AIP and APS (<https://engage.aps.org/stepup/home>)
- Take list of actions for conversations and meetings from Step Up and show the list in QuarkNet meetings.
- Upcoming report from AIP specifically on African-Americans in physics

Advisory Board Recommendations

- Following up on items from last year:
 - Congratulations on successfully handling the budget constraints and successfully operating a thriving program.
 - Continue to ask ATLAS to match CMS funding.
 - Holding the datacamp elsewhere is a lower priority now.
 - Consider also using cheaper cosmic ray detectors.
 - These continue to be attractive options to explore, even though cheaper also means their functionality is limited.
 - This could include commercial products.
 - Congratulations to creating a neutrino masterclass.
 - Thanks for changing the data activities portfolio name.
 - Congratulations to working with more professional organizations and societies.
 - Continue effort on diversity.
 - Continue effort to increase and diversify mentor pool.
 - Congratulations on stabilizing¹ IT support.
 - Thanks for creating a mailing list for advisory board: QUARKNET-ADVISORY-BOARD@fnal.gov
 - Thanks for having an agenda and slides posted.
 - Create external communications strategy (repeated item from last year).
 - Investigate finding someone to take leadership of external strategic communications.
 - Modernize the QuarkNet logo.
- Agenda, major items for discussion and materials should be available a week ahead of next AB meeting.
- Expanding the teacher pool. Reserve some of the data camp slots for recruiting new teachers and to allow new teachers to apply.
 - Consider recruitment bonus for teachers that recruit other teachers.

¹ Trademark QuarkNet Advisory Board

- Can the cosmic ray detectors be used as a recruitment and collaboration tool?
- Are there other ways to get communications out to QuarkNet members?
- Is it possible to evaluate international aspect of program and connections with other efforts?
- Data Activities Portfolio
 - Congratulations to cleaning up the portfolio
 - Add a feedback form to the data activities portfolio.
 - Allows potential new teachers to contact QuarkNet.
 - Provides feedback and user information on activities.
- Other Masterclasses?
 - Neutrino Oscillations
 - Dark Matter - At the LHC this would be missing energy, and there are also direct-detection experiments.
 - LIGO - if LIGO sets it up, it would be available.
- Prioritize IT tasks by reserving some time each year to work on important but not urgent projects, as well as by finding student interns.
- Reaching underrepresented groups.
 - Congratulations to the expanded effort.
 - Maintain flexibility for opportunities.
 - Bring Quarknet into StepUp - so far this connection only goes in one direction.