Parents, counselors, senior staff, faculty, and students,

This is the first time - since the first camp in 2002 - that I am not physically present at the closing ceremony.

In a few hours you will be going home hoping to keep the mathematics flame in you burning EVER BRIGHTER.

[Pause]

We are a lucky people. For we just seek whether P implies Q without having to worry about the truth of P, for if P is false then P does imply Q. Our theorems are the P implies Q we have proved. Our theorems are timeless because they are self-referential truths. Our theorems exist before us and after us – we only discover them. And a very few of us will EFFECTIVELY live beyond their lives – [pause] for discovering a theorem fundamental to an area of mathematics.

What now?

Before you can discover theorems you need to journey to areas where their contexts are. This month-long enrichment program is a part of the beginning of your mathematical journey.

Vitruvius wrote this, but in Latin, over two thousand years ago: *Neither genius without learning nor learning without genius can make a perfect artist*.

You have started early - learning. This gives you the advantage of time, for most significant discoveries in mathematics are made before one is forty.

What now?

Pursuing mathematics as undergraduates soon, you would take the core courses – Real Analysis, Complex Analysis, Topology, and Modern Algebra . And then, if you kept your pursuit, you would go on to a Ph.D. program and learn an area deeper. You study the latest texts on the subject as well as original papers by masters. The mind of the master is writ in the original paper -- the master is with you! You will see the idea emerging. You will gain great confidence in the topic.

What then?

Alain Connes says this in Advice to Young Mathematicians (AYM): "*Once you truly get to know, in an original and "personal" manner, some small part of the mathematical world, the mathematical journey can properly start*." Your deep familiarity with the area will be rewarded with your asking questions for which answers are NOT KNOWN. Michael Atiyah's tells you in AYM to *settle down on one of those problems you find yourself*, a problem not given by the guiding professor, a problem that the professor finds very worthwhile and feels you have a good chance to solve in a couple of years.

The first year or two of research is the most difficult, Atiyah wrote. Because one struggles often with the chosen problem and has serious doubts about one's ability to prove it. But this period will pass. That is, if you can handle stress. You would either succeed in solving the problem or abandon it for later attack and pursue another that you found. Thus you earn Ph.D. - with publishable results - and now your career starts in another institution.

There are three types of problems Bela Bollabas recommends in AYM that mathematicians, particularly the researcher at post-PhD stage, should be involved with.

1 *A "dream' problem which you would love to solve*, which is well-known to perhaps belong to the category of problems that Godel's Incompleteness Theorem refers to – a problem that perhaps can not be solved. But you might use a 'modified Feynman Method' on it. That is, every time you hear a new trick or result, test it against the problem.
2 Then THERE IS THE PROBEM YOU FOUND AND *feel you have a good chance to solve* in a few years. You now have no professor to guide you; but he or she understands your problem and has likely joined pursuit of the problem. This is your main research.
3 Thirdly, from time to time, *work on problems that should be below your dignity and that you can be confident of doing rather quickly, so that time spent on them will not jeopardize your main research*.

Doing research in mathematics is frustrating. If being frustrated is something you cannot get used to, then mathematics is not an ideal occupation for you. Most of the time one is stuck. But there are ways to make this aspect of research less unpleasant. Many people these days work jointly, which, besides having the advantage of bringing different expertise to bear on a problem, allows one to share the frustration. Go to conferences in the topic's area. Also to your math department's colloquia if the topic interests you.

So goes the distilled wisdom of those who have gone before – world-class mathematicians still alive in the dim evenings of their bright lives. But here is what even I can tell you: [Pause] Stress is a constant of living. Stress is the happening of demands that exceed your resources. Yet it is not stress that matters but in how you view it. … There is only one way. That is, don't sweat the small stuff, for almost all stress that come your way are small stuff.

May you have habits for good physical health, a temperament that does not trigger stress easily and a disposition that makes it fun …for others to work with you. It is not how good you are compared to others … but how far you can take what is given to you. Thank-you!