



# FFT, Filtering, and Feedback Control

California Institute of Technology, June 21–23, 2017.

(One set-up available for four participants)

## Host and Mentor



Eric Black is a Lecturer of Physics at the California Institute of Technology. He received his Ph.D. in condensed-matter physics from the University of Colorado at Boulder in 1997 before coming to Caltech, first as a postdoc and then as a staff scientist, as part of the Laser Interferometer Gravitational-wave Observatory (LIGO) project. He currently teaches Caltech's freshman and senior physics laboratories.

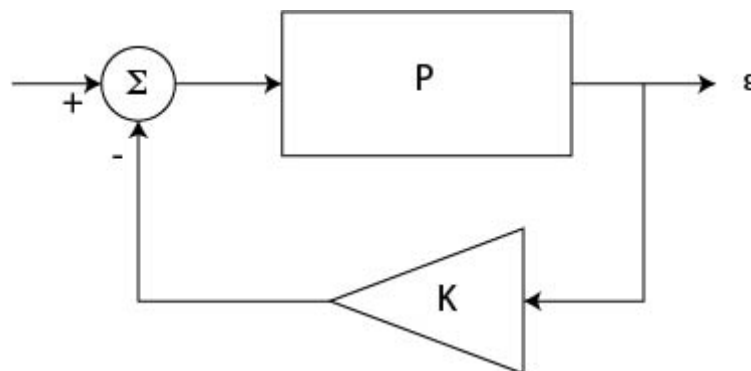
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Kenneth G. Libbrecht (B.S., Caltech; Ph.D. Princeton) is professor of physics at the California Institute of Technology where he is involved in the Laser Interferometer Gravitational Wave Observatory (LIGO), the growth of crystals, notably snow crystals, and physics education. He has helped turn a number of Caltech's new experiments for the teaching labs into commercial products, which may be seen at <http://newtonianlabs.com> and in this Immersion.

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This immersion provides an introduction to active feedback control of dynamical systems. Engineers typically cover this material in a semester- or year-long course, but the essence of the subject can be learned in a much shorter time by the motivated physicist. Necessary background material, including Fast Fourier Transforms and active filtering, will be covered first, followed by the basics of frequency-domain feedback control. The Immersion culminates with an example of noise suppression using active feedback, and an examination of the resulting signal in frequency space compared with the theoretical prediction. This immersion follows the method developed by the Laser Interferometer Gravitational-wave Observatory (LIGO) for giving physicists a crash course in frequency-domain feedback control.



Please note that the Jonathan F. Reichert Foundation has established a grant program ([ALPhA webpage](#); [Foundation website](#)) to help purchase apparatus used in Laboratory Immersions. Limitations and exlusions apply, but generally speaking the foundation may support up to 40% of the cost of the required equipment.