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As World War II loomed, changes were occurring in the cipher bureaus of the likely combatants. One of the changes was that cipher bureaus were beginning to recruit mathematicians to serve as codebreakers. The recruitment of mathematicians was prompted by the advent of the use of cipher machines. In their preparation for war, the US Navy searched college campuses to find people with “cipher brains.” The academic mathematicians who were recruited by the Navy were given little training in cryptology. Two of the mathematicians who were recruited to serve in OP-20-GM, the research section of Naval Communications, were Andrew Gleason and Marshall Hall, Jr. This presentation will consider some of the problems that were faced by Gleason and Hall and the other US Navy cryptologic mathematicians as they attacked the ciphers of the Imperial Japanese Navy and how their being mathematicians directed their attacks. (Received July 24, 2013)