Could something as commonplace as a 52-card deck of playing cards hold the potential for encryption stronger than even the most rigorously scrutinized ciphers in use today? Large files that are transmitted over the internet are often encrypted using a symmetric cipher (such as AES) with a random 128-bit key. Students in an upper-division undergraduate cryptology course were surprised to learn, however, that a well-shuffled deck of cards holds over 225 bits of entropy (randomness). Utilized to its maximum potential, this deck of cards could provide better security than even 128-bit AES. Throughout the course, students were challenged to design cryptosystems in which both encryption and decryption could be carried out efficiently by hand, but would be able to withstand modern cryptanalysis. In this talk, we discuss a few of the ideas for secure hands-on cryptosystems that arose, the inspiration for these ideas, and the overall structure of the course that fostered curiosity and exploration. Moreover, these hands-on cryptosystems would be accessible to any undergraduate audience and would make for a fun, albeit somewhat time-consuming, in-class activity. (Received September 16, 2016)