Cryptology

Cryptography:
secret writing (κρυπτος hidden)

Cryptanalysis:
breaking codes and ciphers

Codes and Ciphers

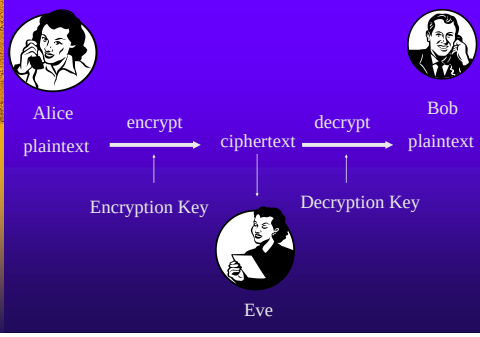
Codes and ciphers render a *plaintext* message unintelligible by applying transformations to the plaintext (*encoding*, or *enciphering* the text).

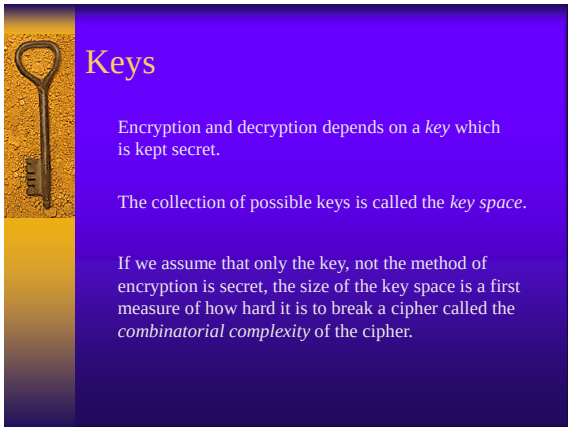
Code: basic transformation is substitution of words by *codewords*.

Cipher: basic transformation is substitution of letters/symbols by letters/symbols.

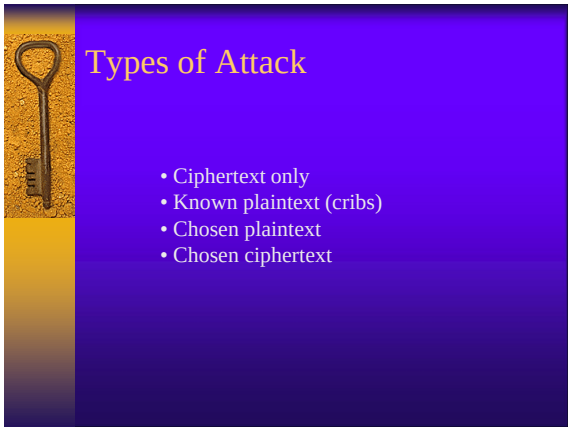
Cipher is often used to denote arbitrary encryption schemes.

Secret Communication

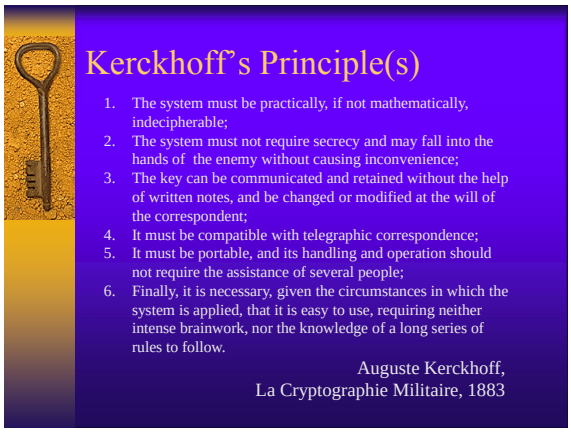



Keys
Encryption and decryption depends on a *key* which is kept secret.
The collection of possible keys is called the *key space*.
If we assume that only the key, not the method of encryption is secret, the size of the key space is a first measure of how hard it is to break a cipher called the *combinatorial complexity* of the cipher.


Eve's Goals
• Reading secret messages
• Finding key
• Corrupting messages (Integrity)
• Masquerade as Alice (Authentication)
Oscar
Mallory


Types of Attack
• Ciphertext only
• Known plaintext (cribs)
• Chosen plaintext
• Chosen ciphertext


Kerckhoff's Principle(s)
1° Le système doit être matériellement, si non mathématiquement, indéchiffrable ;
2° Il faut qu'il n'exige pas le secret, et qu'il puisse sans inconvénient tomber entre les mains de l'ennemi ;
3° La clef doit pouvoir en être communiquée et retenue sans le secours de notes écrites, et être changée ou modifiée au gré des correspondants ;
4° Il faut qu'il soit applicable à la correspondance télégraphique ;
5° Il faut qu'il soit portatif, et que son maniement ou son fonctionnement n'exige pas le concours de plusieurs personnes ;
6° Enfin, il est nécessaire, vu les circonstances qui en commandent l'application, que le système soit d'un usage facile, ne demandant ni tension d'esprit, ni la connaissance d'une longue série de règles à observer.
Auguste Kerckhoff,
La Cryptographie Militaire, 1883


Kerckhoff's Principle(s)
1. The system must be practically, if not mathematically, indecipherable;
2. The system must not require secrecy and may fall into the hands of the enemy without causing inconvenience;
3. The key can be communicated and retained without the help of written notes, and be changed or modified at the will of the correspondent;
4. It must be compatible with telegraphic correspondence;
5. It must be portable, and its handling and operation should not require the assistance of several people;
6. Finally, it is necessary, given the circumstances in which the system is applied, that it is easy to use, requiring neither intense brainwork, nor the knowledge of a long series of rules to follow.
Auguste Kerckhoff,
La Cryptographie Militaire, 1883