

## The Genetic Systems Provided by *E. coli*

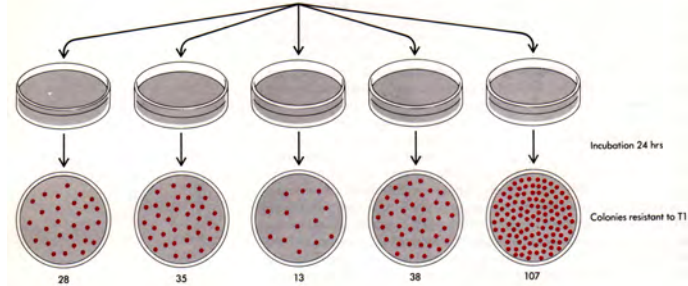
### Molecular Biology of the Gene

### 1. Fluctuation analysis of bacterial resistance to phage

(1943年)

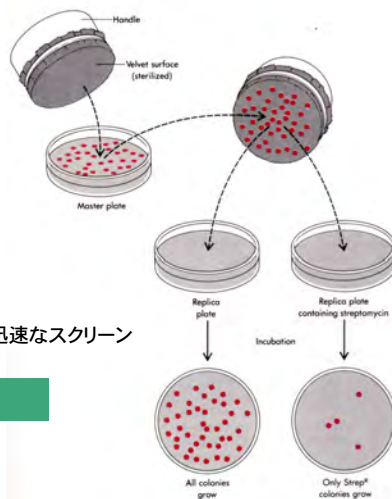
細菌の変異についての適応説  
(ラマルク説)は否定

Five separate  
*E. coli* B cultures are  
inoculated onto plates  
covered with phage T1



遺伝マーカーの迅速なスクリーン

### 2. Replica plating



### 3. Isolation of mutant *E. coli* cells with a specific growth factor requirement

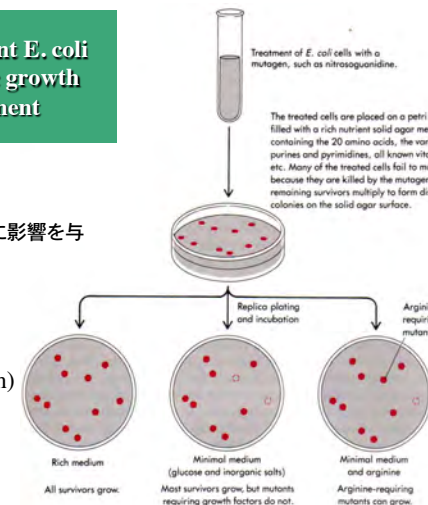
Treatment of *E. coli* cells with a mutagen, such as nitrosoguanidine.

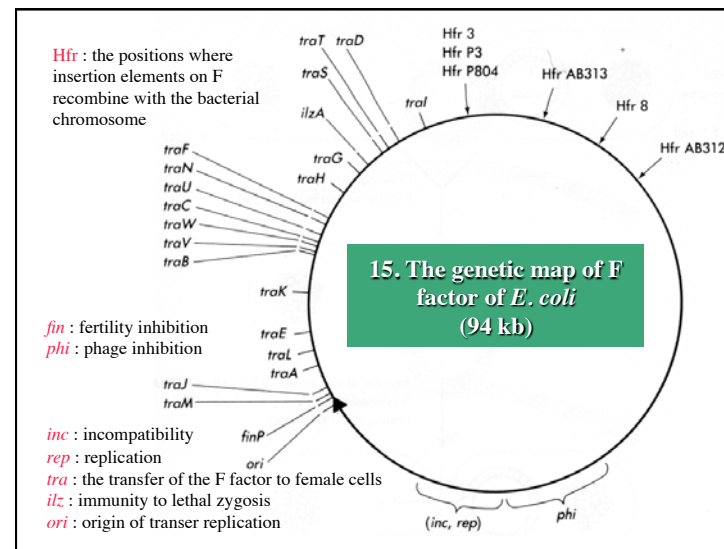
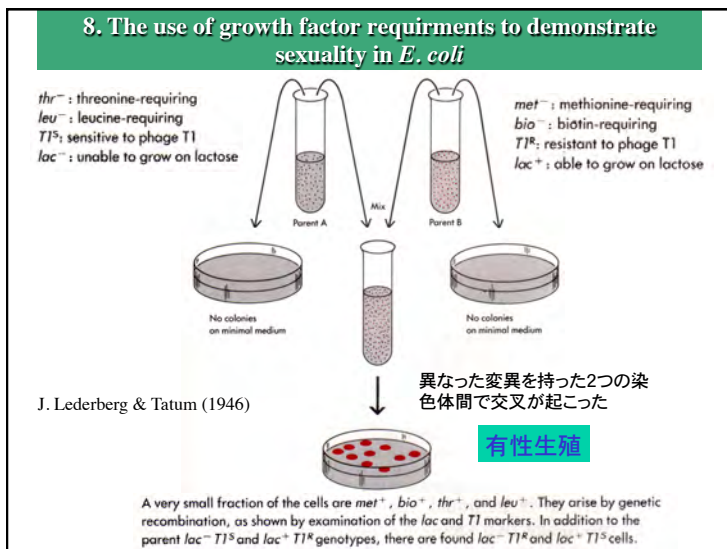
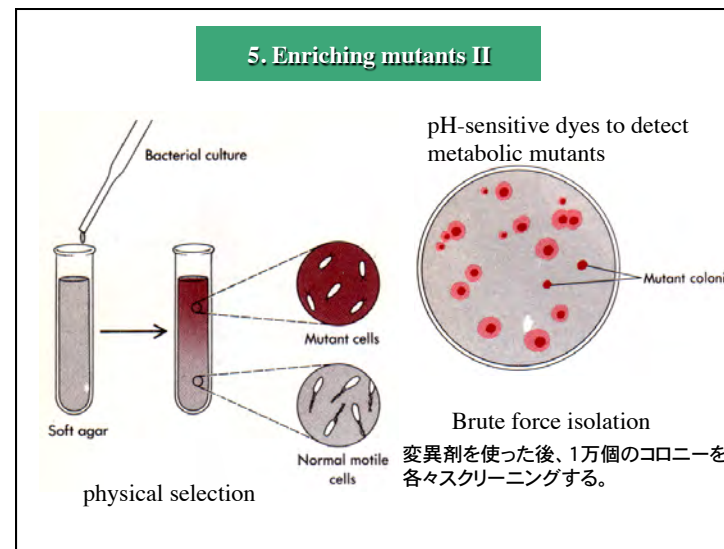
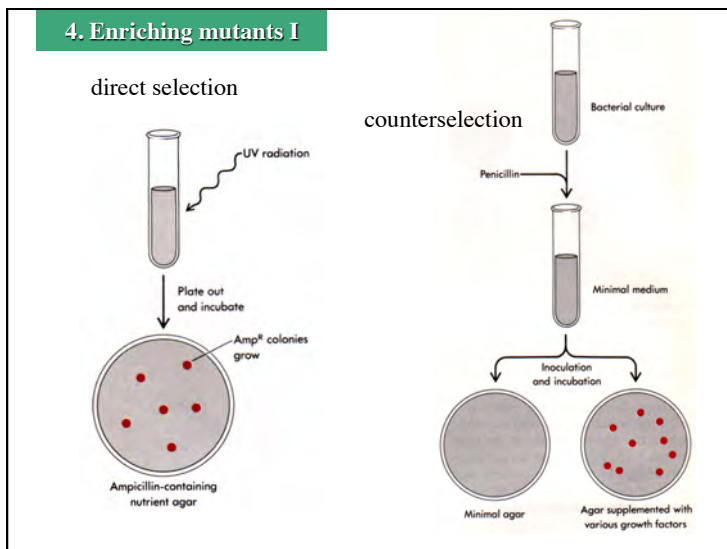
The treated cells are placed on a petri dish filled with a rich nutrient solid agar medium containing the 20 amino acids, the various purines and pyrimidines, all known vitamins, etc. Many of the treated cells fail to multiply because they are killed by the mutagen. The remaining survivors multiply to form distinct colonies on the solid agar surface.

必須代謝物合成能に影響を与える変異体の分離

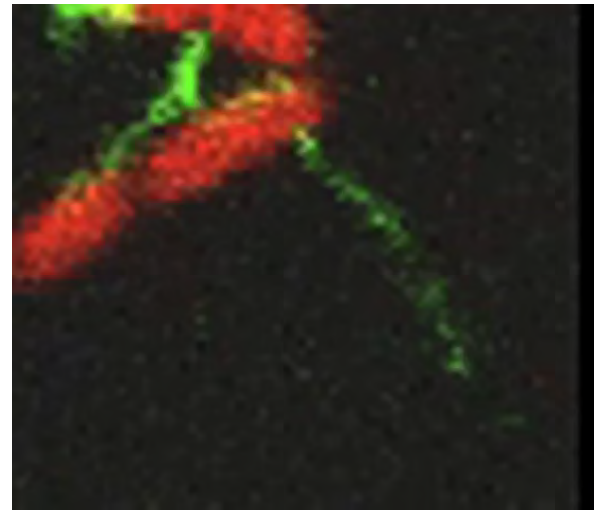
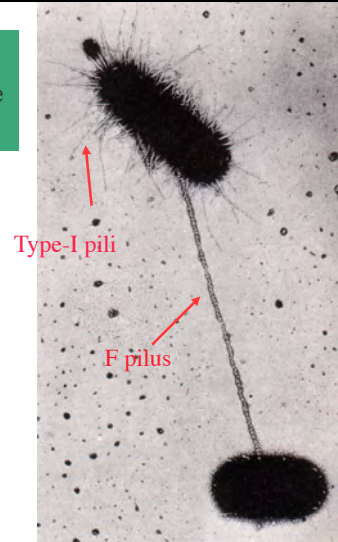
栄養要求株 (auxotroph)  
原栄養株 (prototroph)

(1944年)

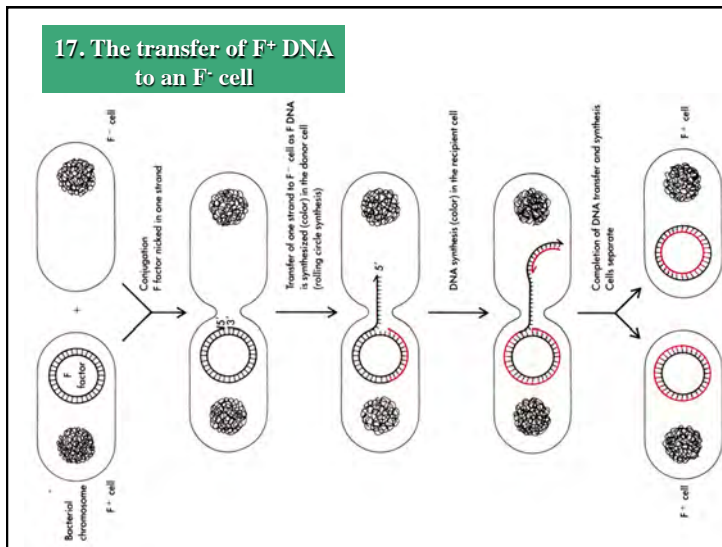




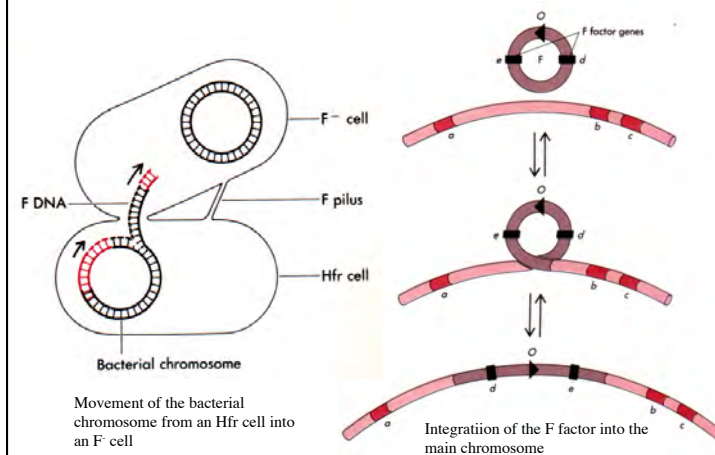
16. The attachment of a male F pilus to the surface of a female cell

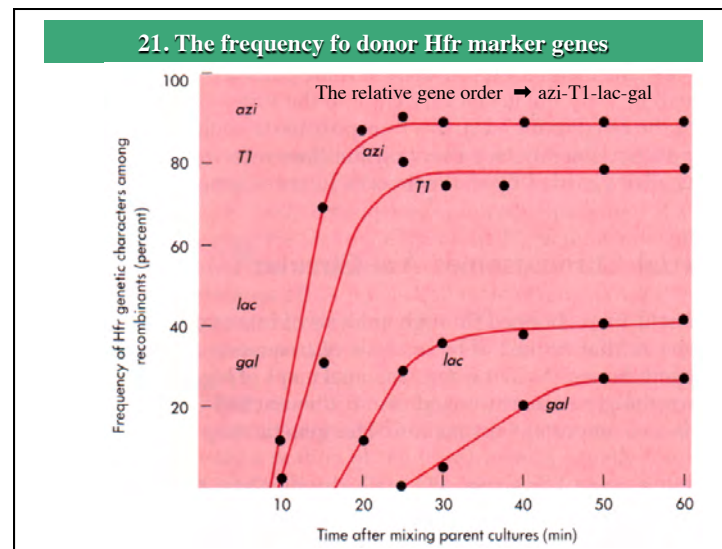
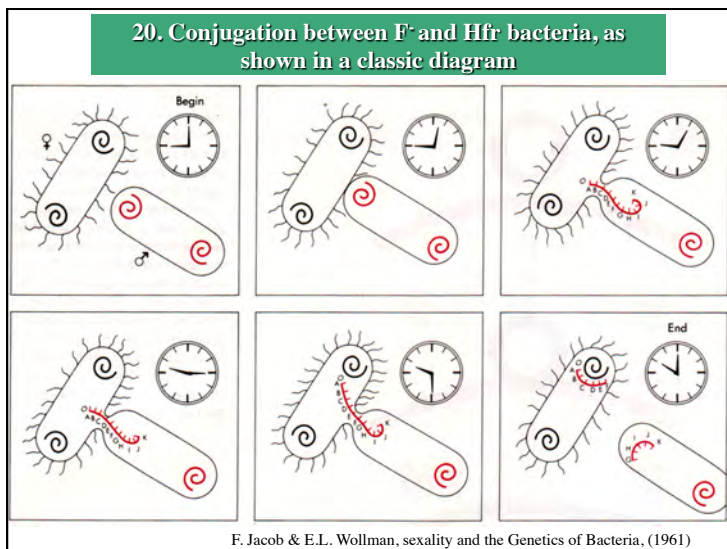


17. The transfer of F<sup>+</sup> DNA to an F<sup>-</sup> cell



18. Hfr (high frequency of recombination)

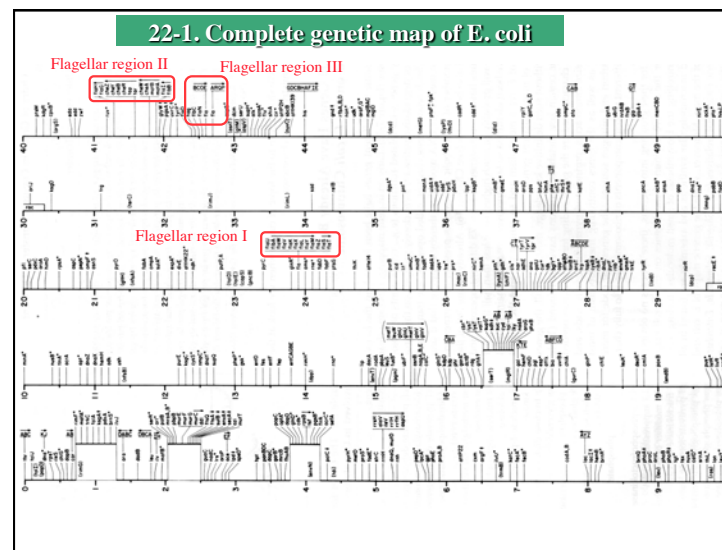


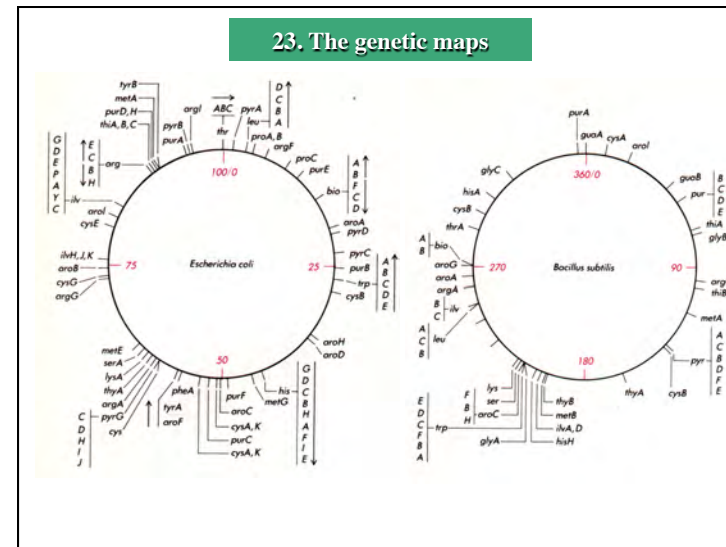
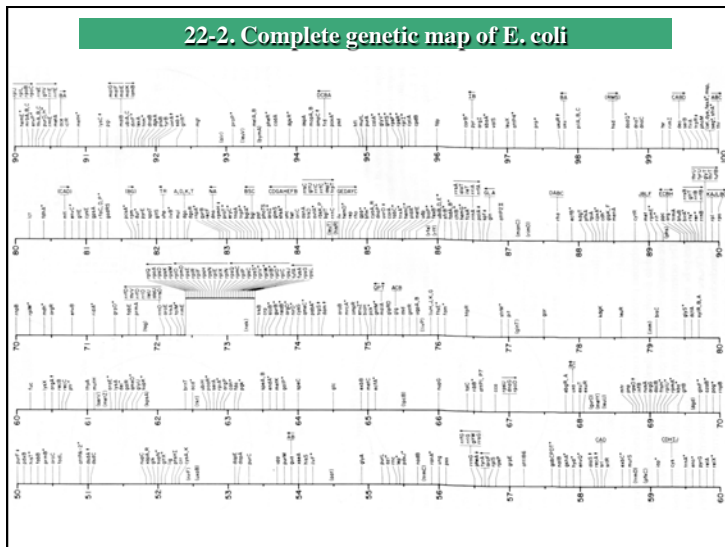


### T1. Order of genes in conjugal transfer in different Hfr strains

Hfr Strain	Order of Gene Transfer
Hayes	O (thr) leu-azi-ton-pro-lac-pur-gal-trp-his-gly-str-mal-xyl-mtl-ile-met-thi
Hfr 1	O-leu-(thr)-thi-met-ile-mtl-xyl-mal-str-gly-his-trp-gal-pur-lac-pro-ton-azi
Hfr 2	O-pro-ton-azi-leu (thr) thi-met-ile-mtl-xyl-mal-str-gly-his-trp-gal-pur-lac
Hfr 3	O-pur-lac-pro-ton-azi-leu (thr) thi-met-ile-mtl-xyl-mal-str-gly-his-trp-gal
Hfr 4	O-thi-met-ile-mtl-xyl-mal-str-gly-his-trp-gal-pur-lac-pro-ton-azi-leu (thr)
Hfr 5	O-met-thi (thr) leu-azi-ton-pro-lac-pur-gal-trp-his-gly-str-mal-xyl-mtl-ile
Hfr 6	O-ile-met-thi (thr) leu-azi-ton-pro-lac-pur-gal-trp-his-gly-str-mal-xyl-mtl
Hfr 7	O-ton-azi-leu (thr) thi-met-ile-mtl-xyl-mal-str-gly-his-trp-gal-pur-lac-pro
AB311	O-his-trp-gal-pur-lac-pro-ton-azi-leu (thr) thi-met-ile-mtl-xyl-mal-str-gly
AB312	O-str-mal-xyl-mtl-ile-met-thi (thr) leu-azi-ton-pro-lac-pur-gal-trp-his-gly
AB313	O-mtl-xyl-mal-str-gly-his-trp-gal-pur-lac-pro-ton-azi-leu (thr) thi-met-ile

SOURCE: From F. Jacob and E. L. Wollman, *Sexuality and the Genetics of Bacteria* (New York: Academic Press, 1961).





### 組み換えDNA技術からゲノム配列決定

1975年: カリフォルニアのアシロマにおいて、組換えDNA実験の安全性に関する激しい論争が、研究者の自主的な会議において展開され、組換えDNA実験の本格的な幕開けとなった。

1979年: 3月我が国においても、組換えDNA実験の開拓に向け「大学等の研究機関等における組換えDNA実験指針」が文部省大臣告示。

1980年: 東京大学医科学研究所および大阪大学微生物病研究所に、組換えDNA実験施設が設置された。

1983年: 東京大学遺伝子実験施設を皮切りに、逐年、組換えDNA実験施設が整備されるようになった。(施設予定地から江戸時代の土器が出土)

1995年: 独立生活を営む生物(細菌)の最初の完全なゲノム配列決定。

2003年: ヒトのゲノム配列完成版が発表される。

2010年: 本間研のピブリオ菌株VIO5の全ゲノム配列を外注で決定。

2010年: 本間研のVIO5変異体の変異部位を次世代シーケンサーで決定。

ゲノミクス から **プロテオミクス**  
配列解読 から **インフォマティクス**

結局 生命現象理解のために、  
**タンパク質の機能解析**をおこなう

