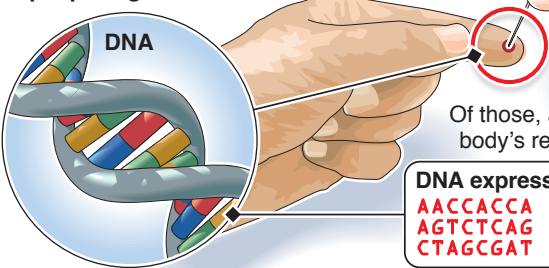


# Biometric QR Codes

The *Quick Response (QR) Code*, a modern-day update of the bar code, has become very popular with marketers because of its ability to carry information, such as web links, that can be read by smartphones. Now medical researchers want to use them to carry parts of people's genetic code

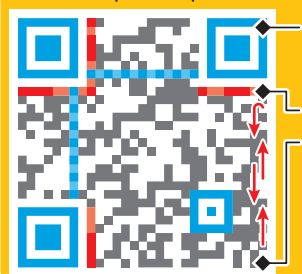


**Human genetic code**  
Strings of **DNA** holding around 23,000 genes.  
Of those, about 400 genes describe body's reaction to pharmaceuticals

**DNA expressed alphanumerically**  
**A**A**C**C**A**C**C**A    **T**C**T**T**A**C**G**    **G**A**T**C**G**C**T**A  
**A**G**T**C**T**C**A**G    **T**A**G**C**A**G**T**    **T**C**T**A**T**G**C**  
**C**T**A**G**C**G**A**T    **A**G**T**C**A**G**T**    ...

## QR CODE DESIGN

Monochromatic pixellated layout, where each black or white square represents **1** or **0** binary code



**Positioning patterns**  
Help QR readers to read data correctly

**Version information**  
**Data content**  
All information stored in "bits", called **modules**. Reads vertically from bottom right corner

## VARIANTS

QR codes come in range of versions from 1 to 40

■ **Level 1:** Holds 25 alphanumeric characters  
**Size:** 97 x 97 modules

■ **Level 40:** Holds 4,296 alphanumeric characters (enough to carry data for 400+ human genes)  
**Size:** 177 x 177 modules

## APPLICATIONS

QR codes could be printed onto patients' **medical cards** to allow doctors to quickly access their genetic information and prescribe better tailored treatments



QR Codes cost-effective as conventionally printed

## BAR CODE HISTORY

- |   |  |   |   |
|---|--|---|---|
| <b>1952:</b> First <b>bar code</b> invented (circular design) | <b>1973:</b> <b>UPC</b> bar code invented (still used today) | <b>1974:</b> <b>Wrigley's Gum</b> first product to print bar code on packet | <b>1994:</b> Subsidiary of Toyota develops <b>QR Code</b> |
|---|--|---|---|