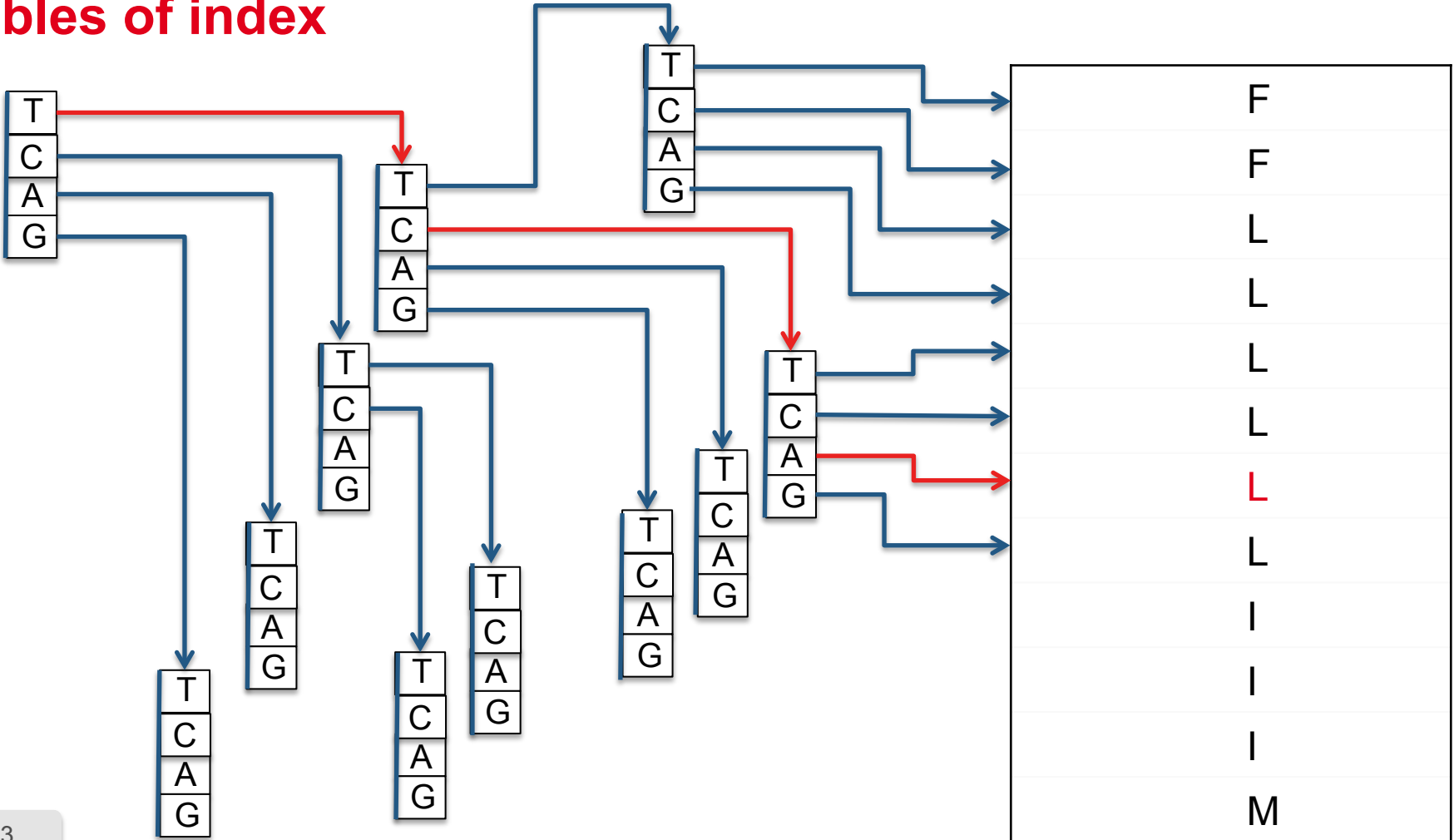


## 2. Genes and proteins

- The sequence as a model of DNA
- Genes: from Mendel to molecular biology
- The genetic code
- A translation algorithm
- Implementing the genetic code
- Algorithms + data structures = programs
- **The algorithm design trade-off**
- DNA sequencing
- Whole genome sequencing
- How to find genes?

# The algorithm design trade-off

# Tables of index



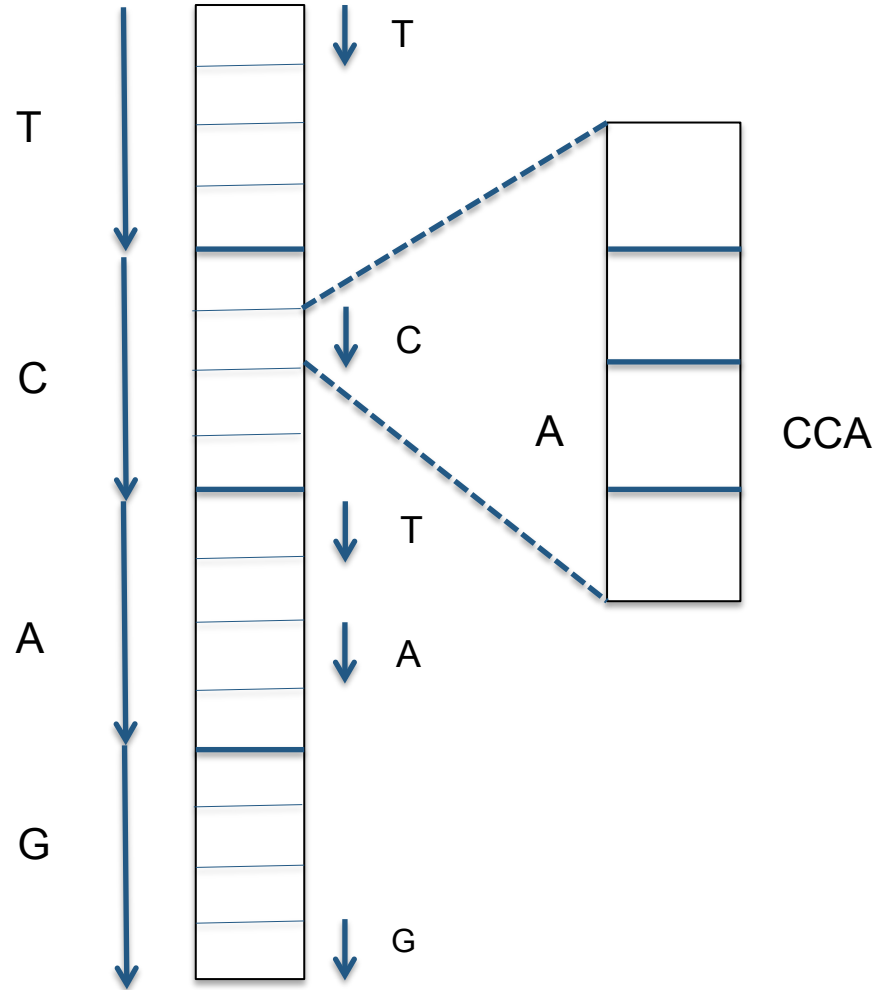
# Computed indexes

```
Function lookupGeneticCode (char1, char2, char3: character)  
returns character  
  
/* GeneticCode: array [1:64] of character  
           is supposed to be known inside the function */  
  
I, J, K: integer  
  
I ← IndexNucleotide (char1)  
J ← IndexNucleotide (char2)  
K ← IndexNucleotide (char3)  
  
return GeneticCode (1 + (I-1)*16 + (J-1)*4 + (K-1))  
end lookupGeneticCode
```

```
Function IndexNucleotide (char: character)  
returns integer  
  
case char of  
    "T": return 1  
    "C": return 2  
    "G": return 3  
    "A": return 4  
endcase  
  
end IndexNucleotide
```

# Computed indexes

- TTT: 1
- GGG: 64
- CCA: 24
- ATT: 49



# Let's evaluate this algorithm

- In the best case: 3 comparisons
- In the worst case: 12 comparisons

But

- 2 multiplications

But

No additional data structures

Trade-off between time performance,  
memory requirements and...  
simplicity