Wuhan Coronavirus

Chen-Hanson Ting

SVFIG

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Wuhan Coronavirus

- **Wuhan Coronavirus can be cured by taking 10 grams of vitamin C every 4 hours, until diarrhea.**

- **Flucan be cured by taking 5 grams of vitamin C every 4 hours, until diarrhea.**

Wuhan Coronavirus

- **Wuhan Coronavirus is now named COVID-19, replacing SARS-CoV-2.**
- **The pandemic now exceeds the size and seriousness of SRAS in 2003.**
- **We still do not know its origin.**

Wuhan Coronavirus

- **Rumors have that it was manufactured in Wuhan P4 Lab.**
- **It is sequenced in many laboratories in many countries.**
- **It is suspected to evolve continually.**

Wuhan Coronavirus

- **It is suspected to have evolved in hosts like bats, snakes, and pangolins.**

- **Relations to other coronaviruses:**
  - **SARS   79%**
  - **Bat Coronavirus   80%**
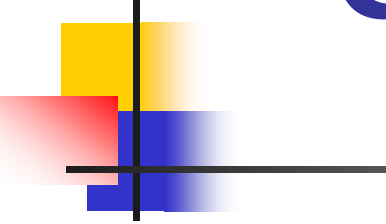 - **Bat RaTG13   96%**

Compare Viral Genomes

- **Have the best tools to compare genomes.**

- **My Exhaustive Pattern Search algorithm can be used to identify repeated sequences in two similar genomes.**

Genomes of SARS-CoV-2

- **I have the best tools to compare genomes.**

- **My Exhaustive Pattern Search algorithm can be used to identify repeated sequences in two similar genomes.**
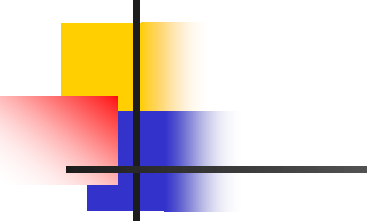
Genomes of COVID-19

ID	Matches	Differences
MN908947	29883	0
MN938384	29758	60
MN975262	29771	100
MN985325	29802	60
MN988668	29861	0
MN988669	29861	0
LC521925	29769	59
LR757995	29811	41
LR757996	29848	0
LR757998	29806	40
SARS-CoV	1618	28113
MERS-CoV	5	30023

Genomes of COVID-19

- **COVID-19 genomes are very different from these of MERS-CoV and SARS-CoV.**

- **3 COVID-19 are identical to the Reference Sequence.**

- **20 differences are caused by 1 different nucleotide.**

- **6 COVID-19 differ from the Reference Sequence by <6 nucleotides.**

Genomes of CoVs

Name	ID	Length
Bat-sl-CoVZC45	MG772933	29802
Bat-sl-CoVZXC21	MG772934	29732
Bat-RaTG13	MN996532	29855
Human CoV-229E	NC_002645	27317
Human SARS-Cov	NC_004718	29751
Human CoV-NL63	NC_005831	27553
Human CoV-OC43	NC_006213	30741
Human CoV-HKU1	NC_006577	29926
Human MERS-CoV	NC_019843	30119
Human COVID-19	NC_045512	29903

Matches in CoV Genomes

Name	ZC45	ZXC21	RaTG13	229E	SARS	NL63	OC43	HKU1	MERS	COVID
ZC45	29782	19509	4593	13	2444	0	7	8	5	4741
ZXC21	19509	29712	4584	11	2563	0	13	7	2	4674
RaTG13	4587	4578	29835	4	1597	0	5	3	13	14946
229E	27	25	24	27297	25	85	24	5	4	24
SARS	2442	2561	1601	9	29731	1	7	5	1	1618
NL63	0	0	0	85	1	27533	4	14	2	1
OC43	9	15	13	12	11	4	30721	313	14	18
HKU1	8	7	3	5	5	14	313	29906	7	18
MERS	5	2	13	4	1	2	14	7	30099	1
COVID	4748	4681	14959	17	1627	1	23	18	1	29883

Matches in CoV Genomes

- **COVID-19 genomes are very different from other coronaviruses.**

- **Best matches to COVID-19 sequences:**
  - **Bat RaTG13**   **14959**
  - **Bat CoVCZC45**   **4748**
  - **Bat CoVCZXC21**   **4681**
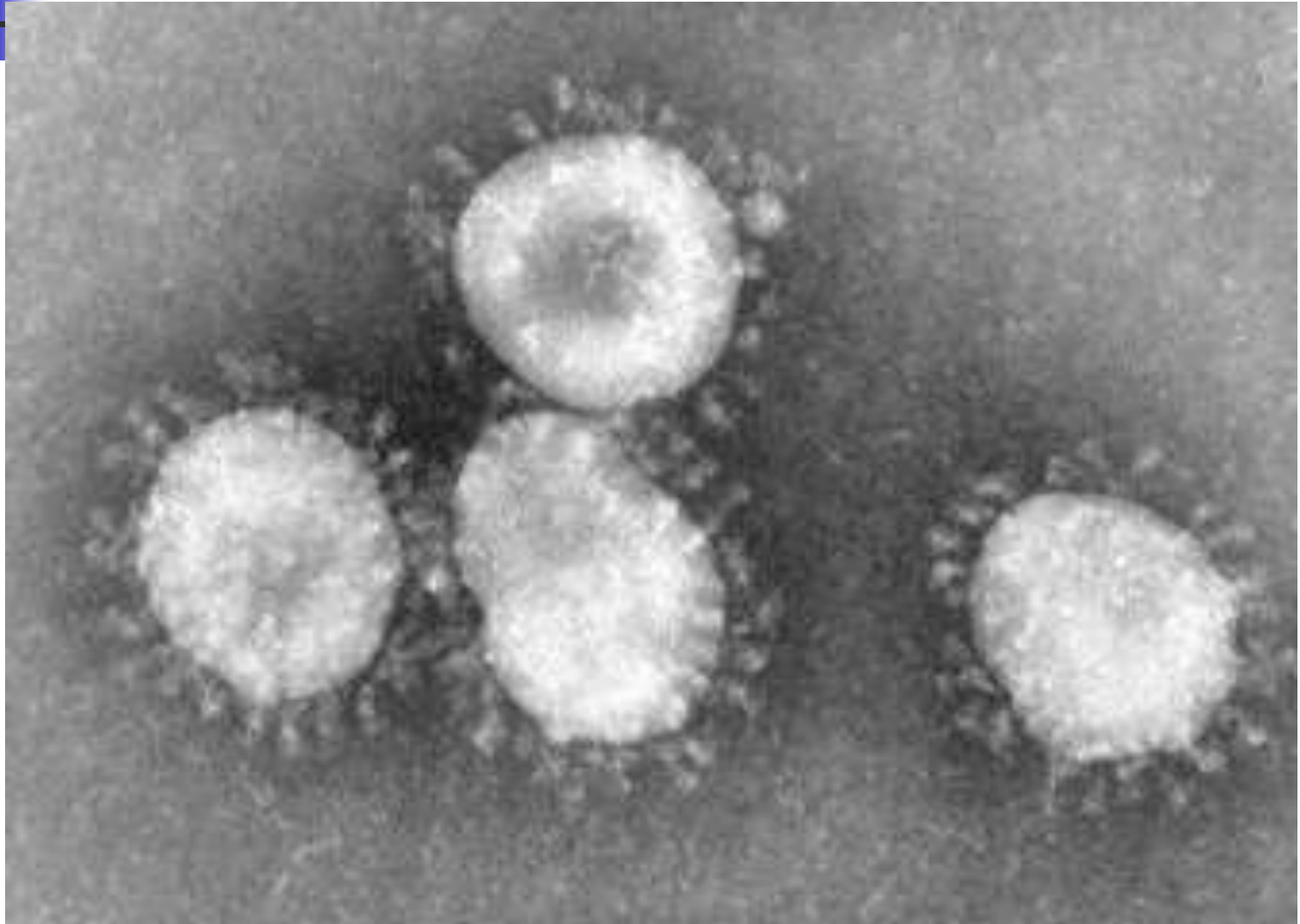 - **Human SARS-CoV**   **1627**

SARS-CoV-2 Engineered?

- **COVID-19 genome is most closely related to Bat RaTG13.**

- **It is so much different from all other coronaviruses that it is unlikely to be engineered.**

- **It is difficult to prove either way unless we have the exact sources from which COVID-19 is assembled.**
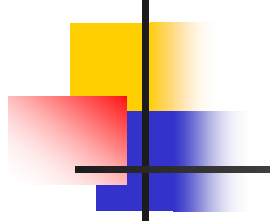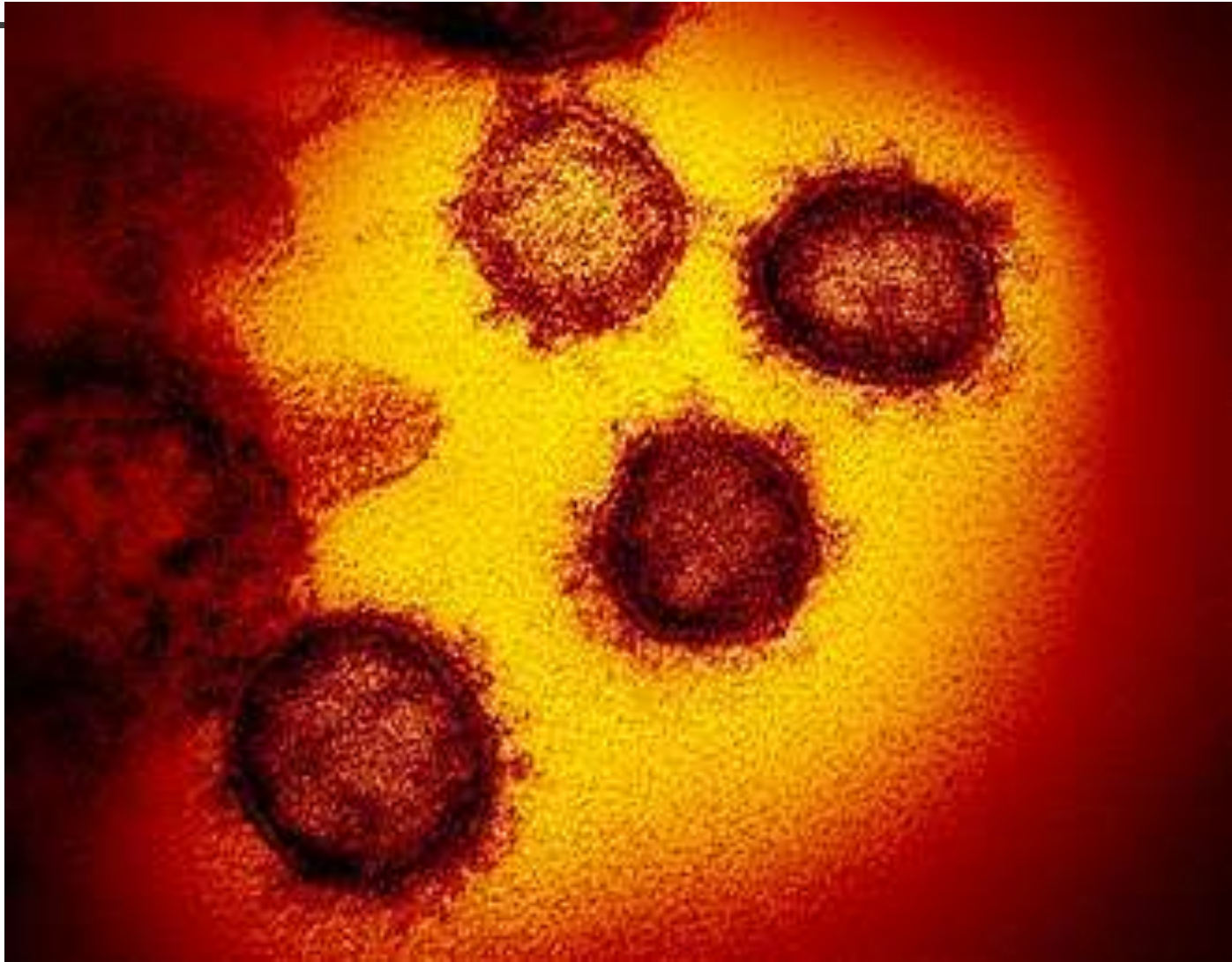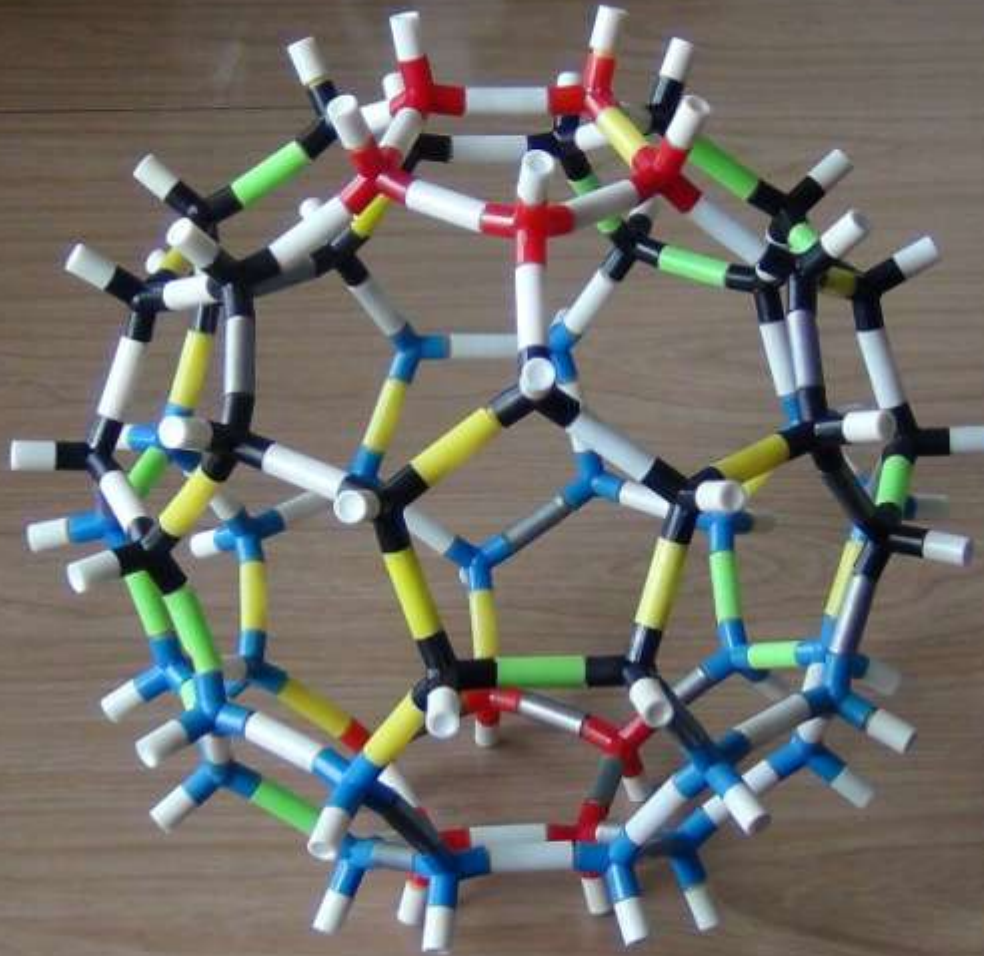
COVID-19

COVID-19

COVID-19

Spike Glycoprotein (S)

RNA and N protein

Envelope

Hemagglutinin-esterase dimer (HE)
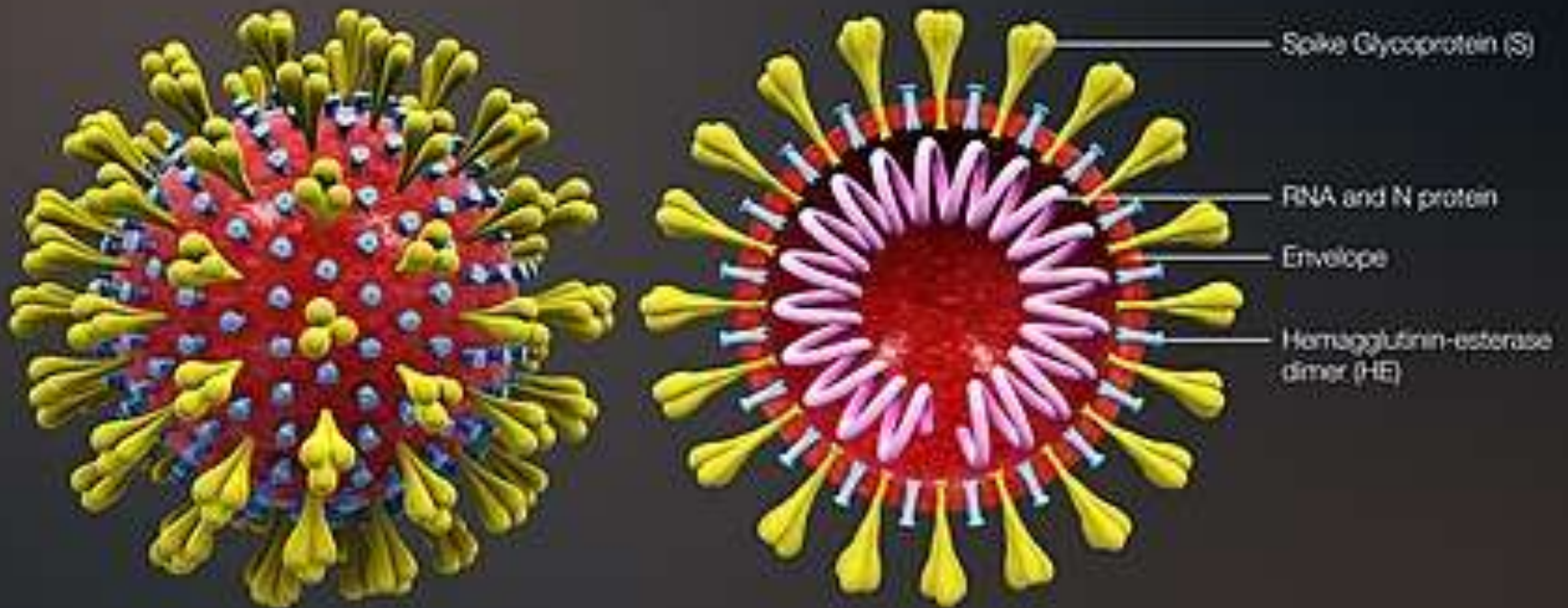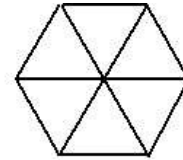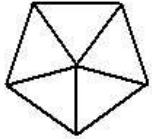
COVID-19 Genome
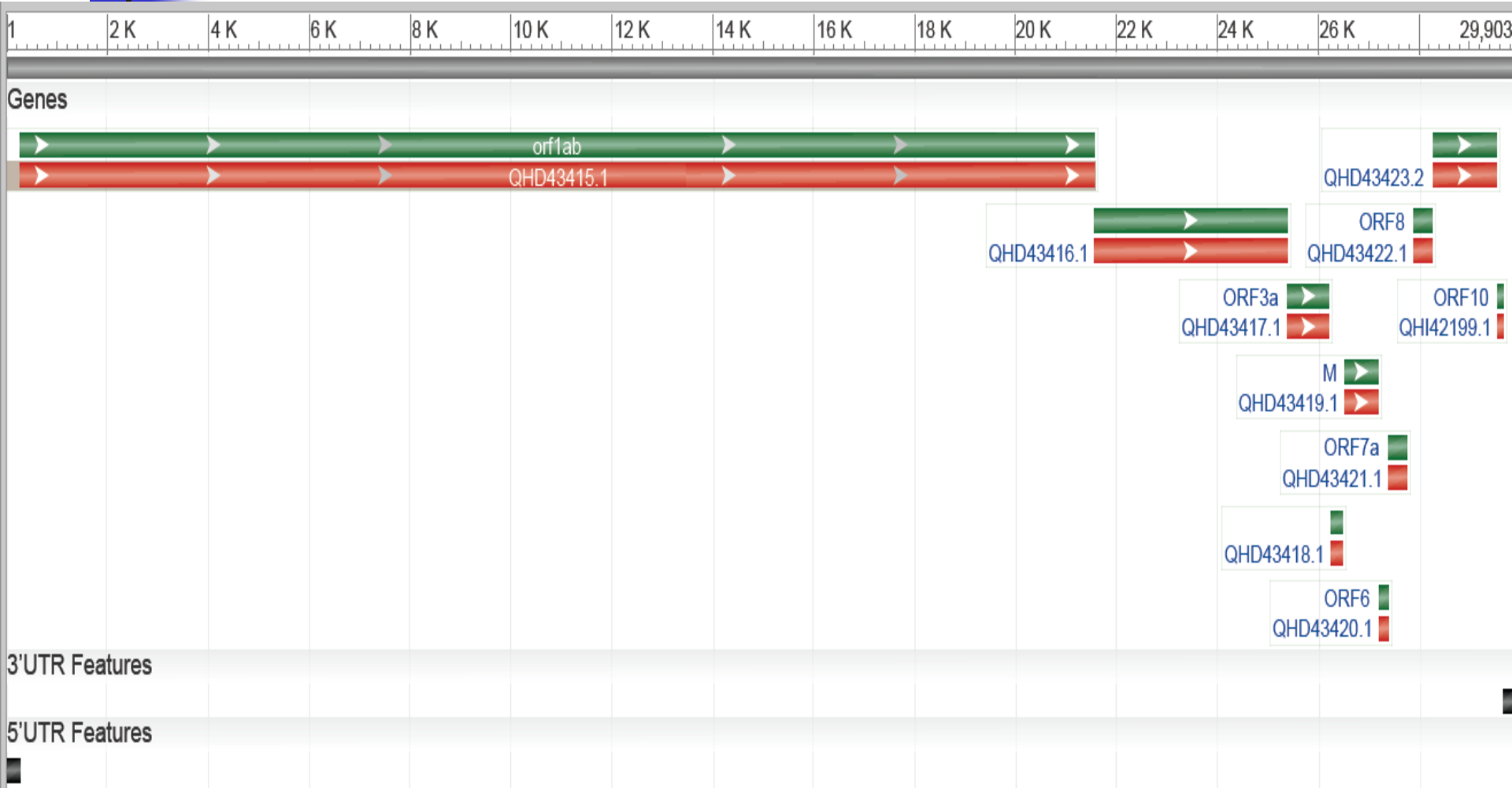
Structure of Coronavirus

- **It has the look of a C60 Fullerene or Buckminsterfullerene molecule.**
- **Fullerene is formed from graphite.**
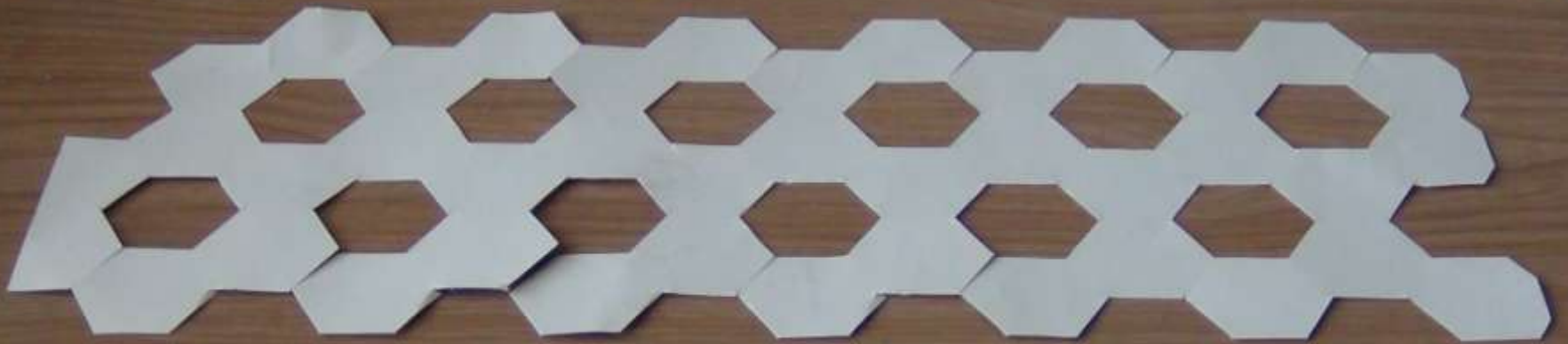- **A plain sheet of graphite buckled under heat to form a ball.**

Fullerene

Fullerene from Graphite
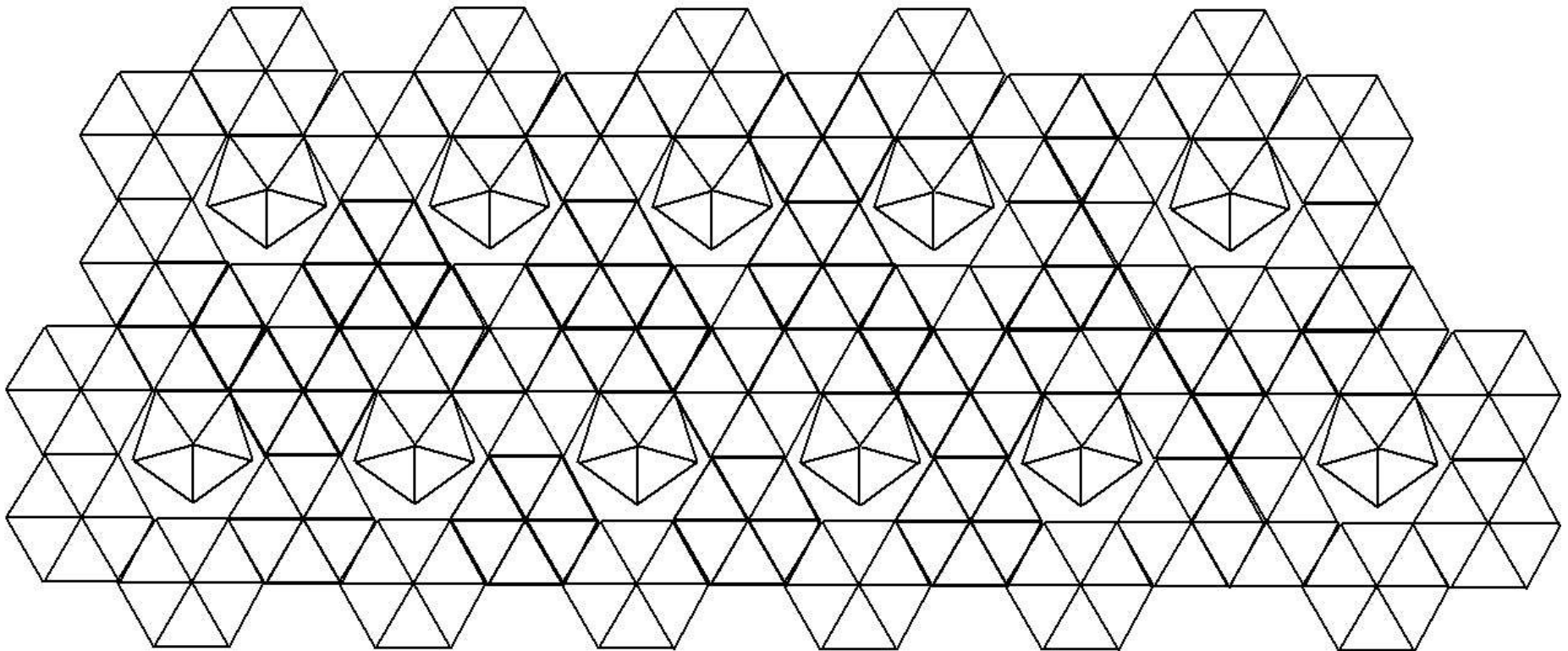
Fullerene

Fullerene
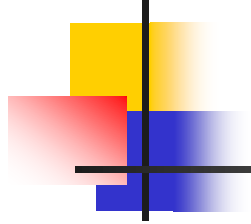
Demo

- **Folding a Fullerene**

Coronavirus Genome

- **It has the look of a C60 Fullerene or Buckminsterfullerene molecule.**

- **Fullerene is formed from graphite.**

- **A plain sheet of graphite buckled under heat to form a ball.**

Questions?

Thank You!