



The God of Christianity and the G.O.D. of Immunology: A Biological Example of Purposeful Randomness

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Some things everybody knows about our bodies:

- Our body is made up of cells
 - Water, various molecules including proteins, and ions
- DNA is the “instruction book” that contains the recipes for making proteins



Some things everybody knows about our cells:

- Different genes (recipes) are active in different organs and body tissues, which result in muscle proteins being made in muscle, etc...
- The DNA in our cells is the same in all cells of our bodies, and is a unique combination of genes inherited from our two biological parents.

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#2 is NOT CORRECT!

Representation of antibody's structure



These are the loops encoded by the part of the DNA that is **variable** from one antibody to the next

Cell (curvature exaggerated)

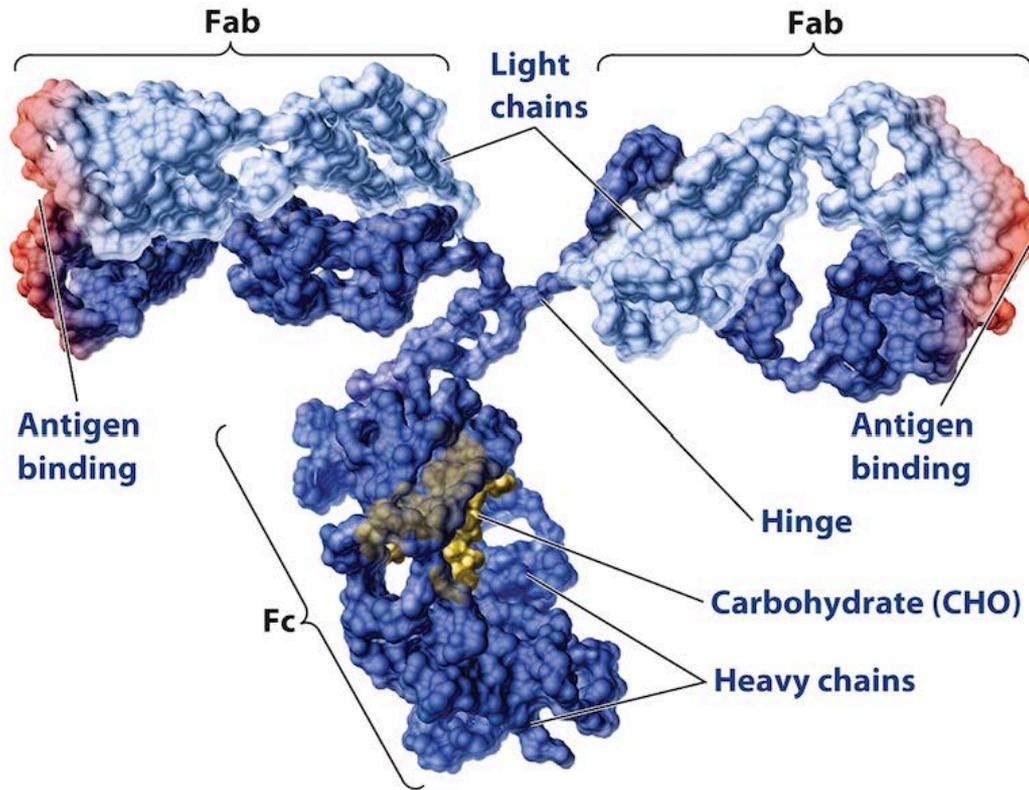
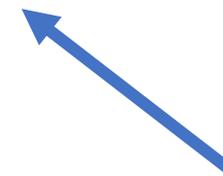
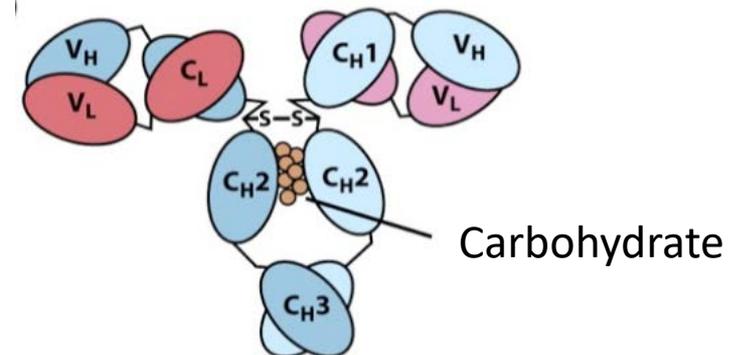


Figure 3-10b
 Kuby Immunology, Eighth Edition
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Antibodies have a distinct and recognizable structure.



The key antigen-binding site is here



Edward Jenner



Edward Jenner c1790...

...and in 1802
caricature





Two mutually exclusive possibilities:

The body has a pool of pre-existing genes that encode anti-smallpox antibodies.

or

The body somehow makes these SPECIFIC anti-smallpox antibodies by getting “information” from the smallpox itself.

Template model of Linus Pauling

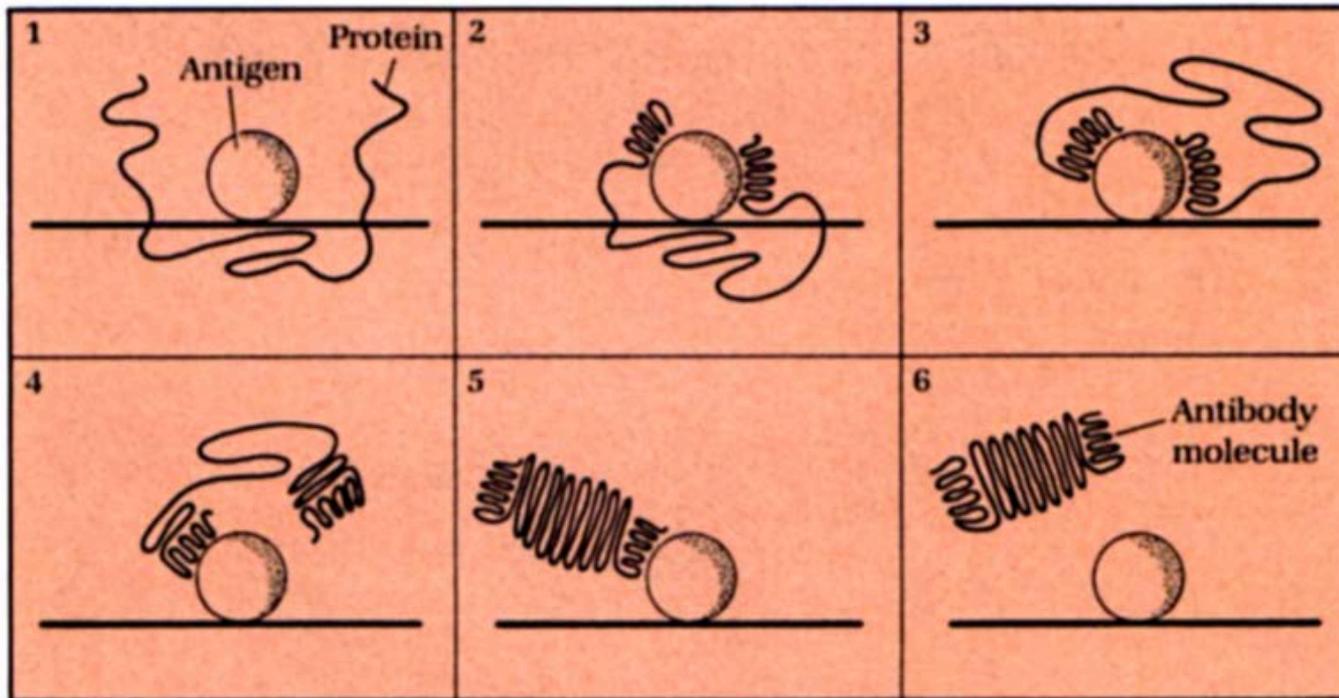
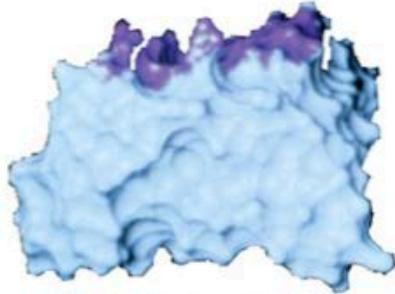


FIGURE 2 DIRECT TEMPLATE THEORY

Linus Pauling's direct template theory. [From Pauling (1940) *J. Amer. Chem. Soc.* 62, 2643]

Binding surfaces of 6 different antibodies

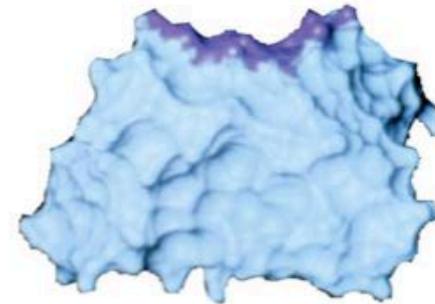
(a)



HyHel-5

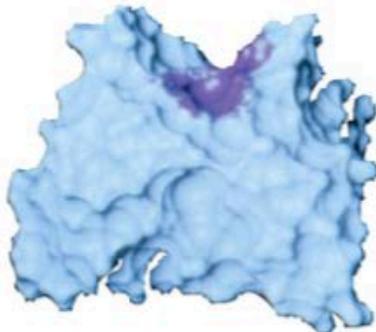


HyHel-10

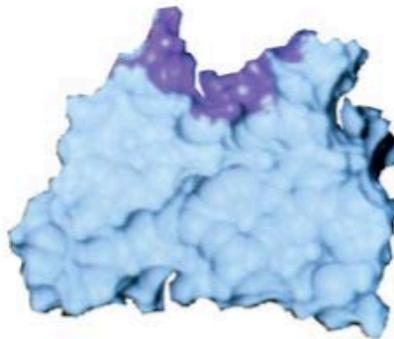


D1/3

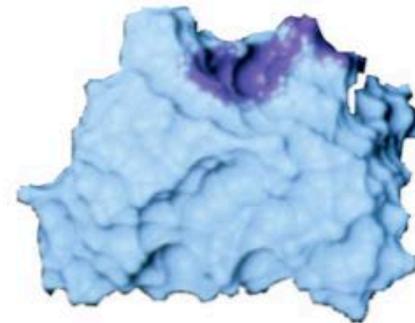
(b)



McPC603



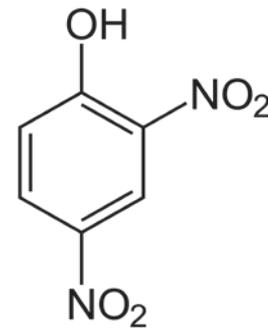
BV04



17/9

So...

How does the body make antibodies
against substances never seen
before, and even those not found in
nature?



Anti-DNP /
Dinitrophenol...
\$935.00

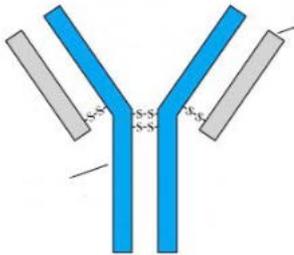
New B-cells are born all the time

New specificities are continually being generated

Cells making...

...useful antibodies divide and grow

...harmful antibodies (self reactive) die a quick death



Not only is the precise genetic sequence not pre-determined, but also the precise location in 3D space of individual chemical species that contribute to binding is not easily predicted or determined in advance.

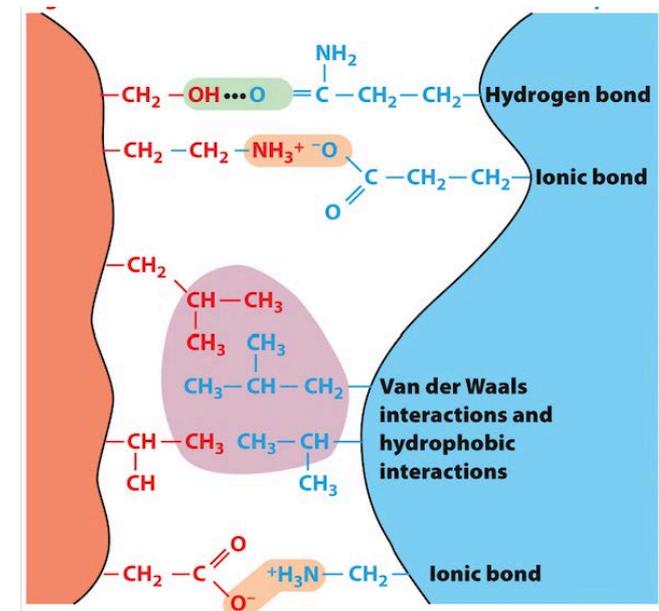
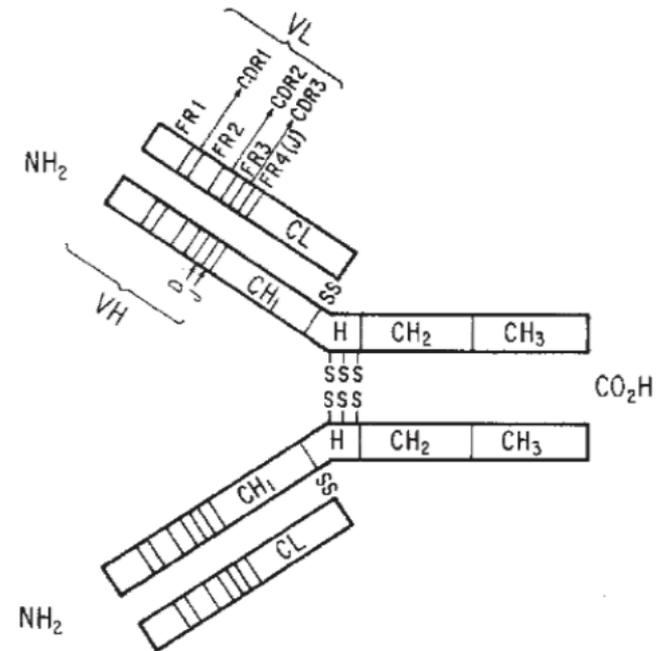


Figure 3-1
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How is the immune system able to react to so many different compounds?

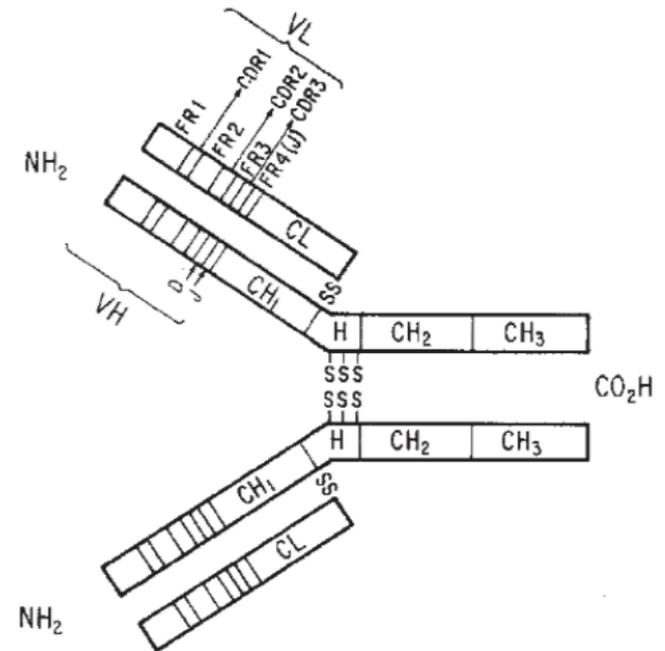
- First, I want to convince you that the mechanism whereby antibodies are generated is random, and by this I mean extremely unpredictable.
 - *It is this very unpredictability which allows the system to work.*
- Second, I hope by this example to raise questions about the role of God in “directing” events in nature such as this, which do appear random.
 - I believe that God undergirds all of nature, yet allows truly random things to happen. There are various ways of reconciling randomness with God’s sovereignty.

Antibody Structure



Tonegawa 1983

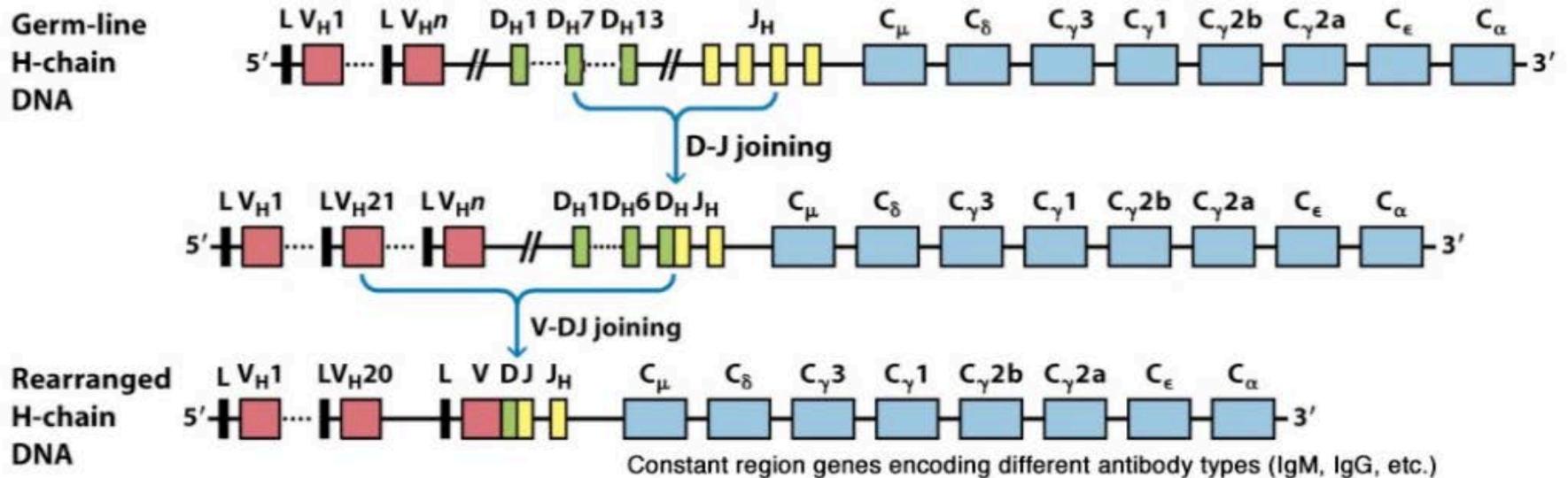
- Tonegawa figured out that the antibody gene DNA of body cells (eggs, sperm, liver...) was different than the antibody gene DNA taken from antibody-producing cells (B cells).
- This was a major discovery.



Antibody genes are complicated!!

Example 1: Combinations of Gene Segments

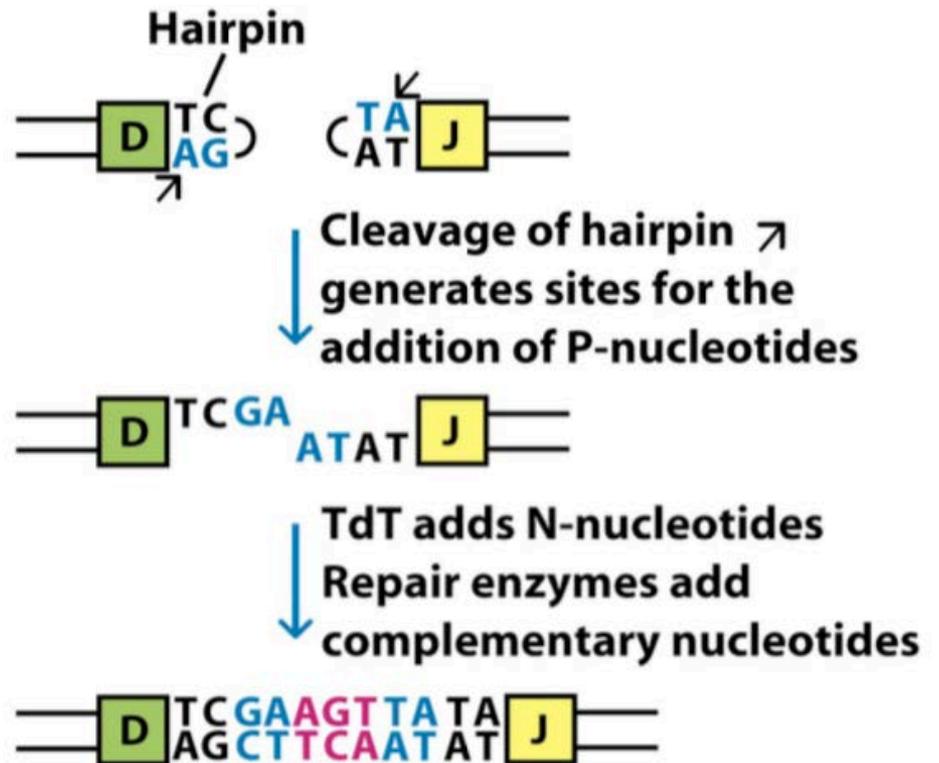
Many V regions + Additional segments



Antibody genes are complicated!!

Example 2:

Imprecise joining
of the segments



Mechanisms to generate antibody diversity

- Sources of antibody diversity:
 1. **Two Chains:** antigen binding site is a combination of one light chain and one heavy chain
 2. **Many V regions:** Each chain is formed by selecting one from among many variable gene segments
 3. **Additional Gene Segments:** Each of the variable regions is actually a combination of multiple gene segments, for the light chain V+J, for the heavy chain V+D+J.
 4. **Junctional Diversity:** The junctions between gene segments are joined in an imprecise manner

What is God's role in antibody generation?

- Can God predict what to us is unimaginably unpredictable?
- Is it possible that God allows “random” processes to unfold “naturally” without his *continual* intervention?
- Is it possible that God actually does not know the precise path of such events (i.e. the future) only because it is not knowable (hasn't happened yet), not because he is inherently limited?
- Alternatively, perhaps God continually determines the “random numbers” that dictate the behavior of all matter, and therefore knows all future events.
- Does God exist both inside of and outside of time, being “present” in the future, therefore knowing the ultimate outcomes of natural events?

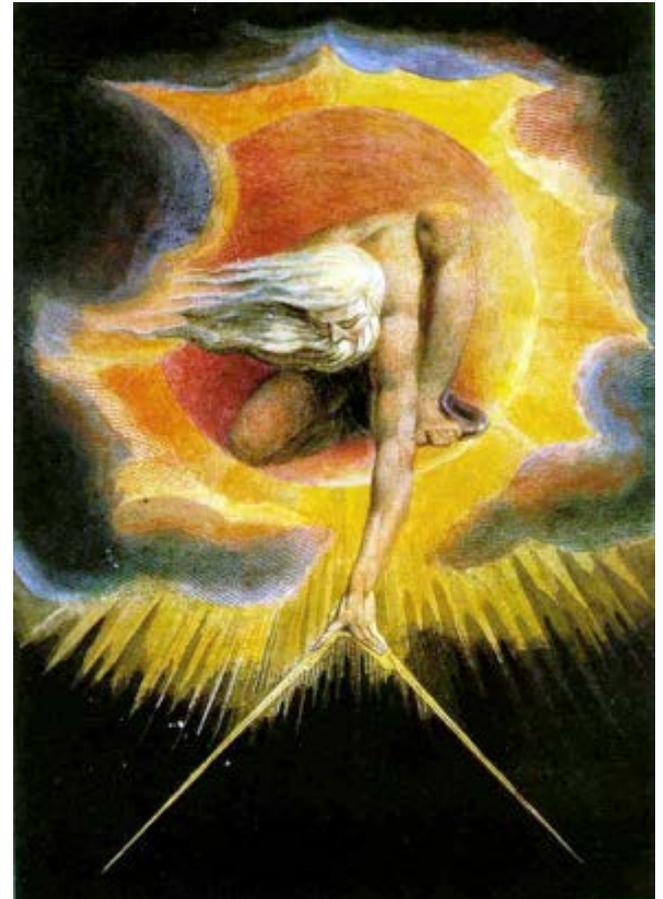
Does the Bible offer help?

God “Upholds the universe by his word of power”

“In Christ all things hold together.”

Hebrews 1:3,
Colossians 1:17

How are we to understand these statements?



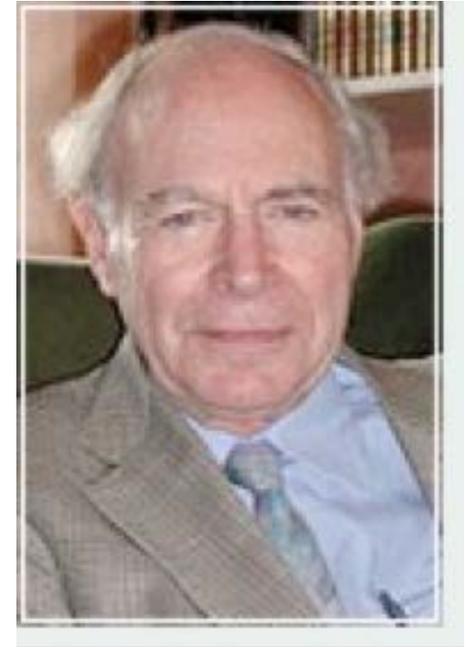
William Blake, The Ancient of Days

Arthur Peacocke (2000)

“God exists and interpenetrates every part of nature, and timelessly extends beyond as well.”

In this scheme, if God were to not exist, so also all matter and energy of the universe would also cease to exist, however God is also transcendent over the universe.

“...the role of chance... seems to me neither repulsive nor attractive, but simply what is required if all the potentialities of the universe, especially for life, were going to be elicited effectively.”



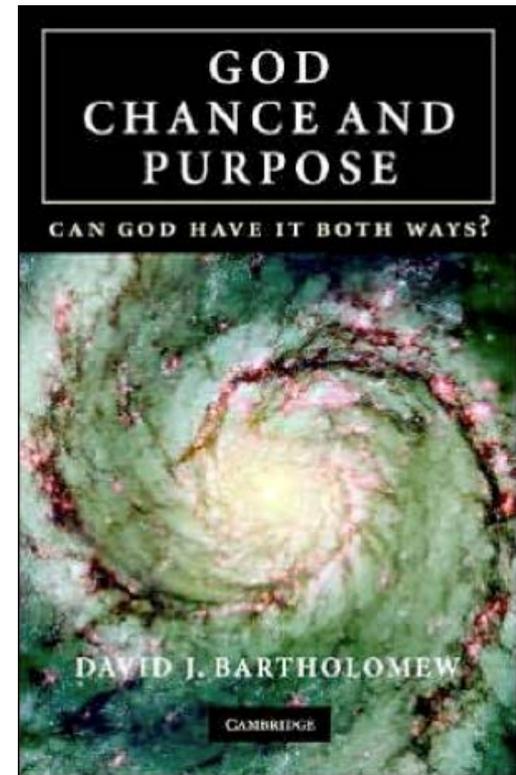
From Templeton Website

David J. Bartholomew (2008)



Chance events should be seen as within the providence of God.

“Chance is a necessary and desirable aspect of natural and social processes which greatly enriches the potentialities of the creation.”



Anti-randomness statements

There is no room for uncertainty (randomness) in nature. We only think certain things are random, but they really are not.

-William Dembski, 2009

“There are no accidents.” -pastor Bob May 25, 2008

Quantum mechanics is certainly imposing. But an inner voice tells me that it is not yet the real thing. The theory says a lot, but does not really bring us any closer to the secret of the 'old one'. I, at any rate, am convinced that **He does not throw dice.** -

A. Einstein 1926 (translation)



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“You craaaazy man!” Dave T

Aubrey L. Moore (1848-1890)

“The one absolutely impossible conception of God, in the present day, is that which represents him as an occasional visitor. Science has pushed the deist’s God further and further away, and at the moment when it seemed as if He would be thrust out all together, Darwinism appeared, and, under the disguise of a foe, did the work of a friend... Either God is everywhere present in nature, or he is nowhere.”



Photo credit: Keble College, University of Oxford

Aubrey L. Moore (1848-1890)

“[evolution] *as a theory* is infinitely more Christian than the theory of "Special Creation." For it implies the immanence of God in nature, and the omnipresence of His creative power. Those who opposed the doctrine of evolution in defence of "a continued intervention" of God seem to have failed to notice that ***a theory of occasional intervention implies as its correlative a theory of ordinary absence*** [emphasis in original].”



Photo credit: Keble College, University of Oxford

From "Darwinism and the Christian Faith" in "Science and the Faith" (1893)

What do you think?

Perspectives on Science and Chr. Faith (PSCF) paper

Article



Craig M. Story

The God of Christianity and the G.O.D. of Immunology: Chance, Complexity, and God's Action in Nature

Craig M. Story

Many people of faith have difficulty with the idea that randomness can exist in nature; randomness is viewed as directly conflicting with God's sovereignty. Biological processes often rely on randomness to achieve important ends. The example of antibody gene rearrangement is discussed as a primary example of such processes, and the ways God can be understood to be acting in the face of apparently random processes are explored.