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Third Edition

ABOUT THE AUTHOR(S)

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Author One

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DEDICATION

fdd_tx *To Judy, my wife and friend, for sharing
life's adventures.*

fdd_au Author One
Author University fdd_af

*To Daria for the warmth of memories past
and the excitement of adventures to come.*

Author Two

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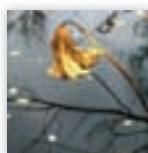
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Thank you to all my reviewers for the assistance you provided
me throughout the publishing process.

fpr_au -John Q. Author
fpr_af Author University

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Part Outline bputo_tt

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|----|-------------------------------------|-----|----------|
| 15 | Programming for Reliability | 000 | bputo_ln |
| 16 | Software Reuse | 000 | |
| 17 | Computer-Aided Software Engineering | 000 | |
| 18 | Software Development Enviornments | 000 | |

The Earth Science Tradition

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This is an example of a photo caption that would appear in the part openers. (Photo courtesy of Getty Images).

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bch_tt A Reduction in Atmospheric Ozone

bch_st Let the Sunshine In

This is an example of a photo caption that would appear in the part openers. (Photo courtesy of Getty Images).

bchob_tt Chapter Objectives

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This is an example of a photo caption that would appear in the part openers. (Photo courtesy of Getty Images).

Chapter Outline

- 16.1 Programming for Reliability 000
- 16.2 Software Reuse 000
- 16.3 Computer-Aided Software Engineering 000
- 16.5 Software Development Envriornments 000
- 16.6 Programming for Reliability 000
- 16.7 Software Reuse 000
- 16.8 Computer-Aided Software Engineering 000
- 16.9 Software Development Envriornments 000
- 16.10 Programming for Reliability 000
- 16.11 Software Reuse 000

CHAPTER

16

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The Earth Science Tradition

This is the Subtitle

Chapter Objectives

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bchop_fgct This is an example of a photo caption that would appear in the part openers. (Photo courtesy of Getty Images).

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bchto_tt

Chapter Outline

- 16.1** Programming for Reliability 000
- 16.2** Software Reuse 000
- 16.3** Computer-Aided Software Engineering 000
- 16.5** Software Development Enviornments 000
- 16.6** Programming for Reliability 000
- 16.7** Software Reuse 000
- 16.8** Computer-Aided Software Engineering 000
- 16.9** Software Development Enviornments 000
- 16.10** Programming for Reliability 000
- 16.11** Software Reuse 000

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CHAPTER

16

The Earth Science Tradition

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Chapter Objectives

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The Earth Science Tradition

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bopcs_st

Saving an African Eden

This is an A-Head bopcs_ha

The fact that viruses cannot multiply without first infecting a host cov To To find out more about the structure of the tails, the ATV genome tein find out more about the structure of the tails, the ATV genome tein ered (see Box figure). This archaeal virus was found in acidic hot springs (pH) *Acidianus convivator*. bopcs_tx

This is a B-Head bopcs_tb

To find out more about the structure of the tails, the ATV genome tein To find out more about the structure of the tails, the ATV genome tein assemble into filamentous structures.

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

$$\boxed{\text{bopcs_eq}} \quad a + b = c$$

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva* “forms”— 85–93°C) in Italy where it infects the hyperthermophilic.

This is a C-Head bopcs_hc

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infection.

1. In many cases, these spikes are involved in virus attachment to the host cell surface. bopcs_ln
- a. How might a in to support their peers?
- b. Wow do we the learning of each student? bopcs_lnla
- c. How we set high standards fro are reachable fro individual students?

10. In many cases, these spikes are involved in virus attachment to the host cell surface.

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88. In many cases, these spikes are involved in virus attachment to the host cell surface.

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In many cases, these spikes are involved.

In many cases, these spikes are involved in virus attachment to the host cell surface.

In many cases, these spikes are involved. bopcs_lu

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¹Häring, M.; Vestergaard, G.; Rachel, R.; Chen, L.; Garret, R. A.; and Prangishvili, D. 2005.Independent virus development outside a host. Nature 436:1101–02. Source: Rand McNally

bopcs_so

bopcs_fn

Table 22.22 Climate Regions bopcs_tbtt

Letter	Name	Characteristics		bopcs_tbcn
		W E T	R E G I O N S	
<i>Region A</i>	Tropical		Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	bopcs_tbx
<i>Region B</i>	Subtropical		1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of Earth's surface.	bopcs_tbln
D R Y R E G I O N S				
<i>Region C</i>	Tundra		• Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F). • Wet, hot regions that cover about a third of Earth's surface.	bopcs_tbso

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bopcs_tbfn

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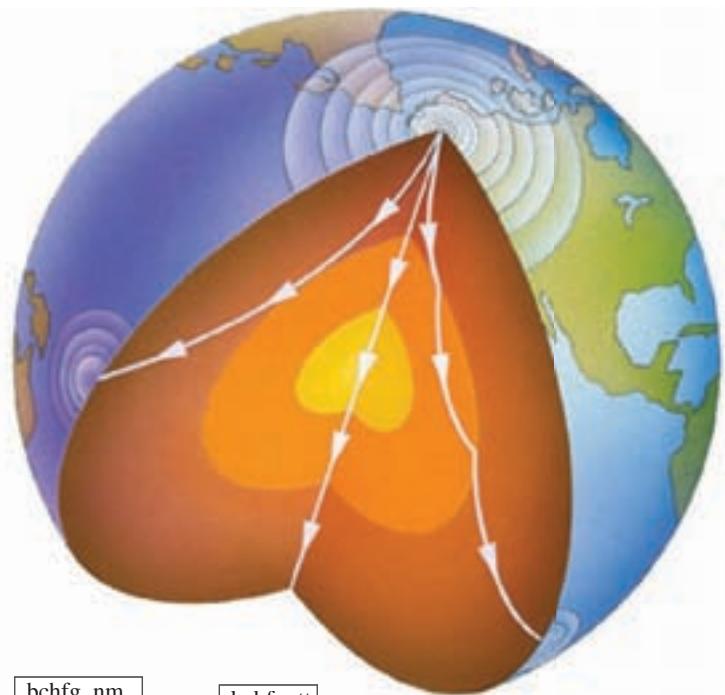
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bchfg_nm

bchfg_tt

Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). Source: TNT

bch_fgso**bch_fgct****bch_tbnm**

Table 22.22 Climate Regions

Letter	Name	Characteristics	W E T R E G I O N S	
			bch_tbnn	
<i>Region A</i>	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	bch_tbhs	
bch_tbsh			bch_tbx	
<i>Region B</i>	Subtropical	1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of Earth's surface.		
			bch_tbln	
D R Y R E G I O N S				
<i>Region C</i>	Tundra	• Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F). • Wet, hot regions that cover about a third of Earth's surface.		
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Figure 5.11 Examples of Icosahedral Capsids.

(a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). Source: Getty Images

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Table 22.22 Some Noteable Earthquakes Over the Last Milenia

Year	Location	Deaths (estimated)	Magnitude	Comments
1556	Shensi, China	830,000	—	Possibly the greatest natural disaster.
1755	Lisbon, Portugal	70,000	—	Tsunami damage extensive.
1811–1812	New Madrid, Missouri	few	7.9	Three major earthquakes.
1886	Charleston, SC	60	—	Greatest historical earthquake in the eastern United States.
1906	San Francisco, CA	1,500	7.8	Fires caused extensive damage.
1556	Shensi, China	830,000	—	Possibly the greatest natural disaster.
1755	Lisbon, Portugal	70,000	—	Tsunami damage extensive.
1886	Charleston, SC	60	—	Greatest historical earthquake in the eastern United States.
1908	Messina, Italy	120,000	—	

bchba_tt Earth Systems

bchba_st Global Warming and Glaciers

This is an A-Head

bchba_ha

The fact that viruses cannot multiply without first infecting a host cov
To To find out more about the structure of the tails, the ATV genome
tein find out more about the structure of the tails, the ATV genome
tein ered (see Box figure). This archaeal virus was found in acidic hot
springs (pH) *Acidianus convivator*.

This is a B-Head

To find out more about the structure of the tails, the ATV genome tein
To find out more about the structure of the tails, the ATV genon
assemble into filamentous structures.

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

$$\boxed{\text{bchba_eq}} \quad a + b = c$$

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva* “forms”—85–93°C) in Italy where it infects the hyperthermophilic.

This is a C-Head

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infecion.

1. In many cases, these spikes are involved in virus attachment to the host cell surface.
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information visit bchba_ur.com.

Stegenga, M. V. Stengaard, G.; Rachel, R.; Chen, L.; Garret, R. A.; and Prangishvili, D.
bchba_so Lent virus development outside a host. Nature 436:1101–02. Source:
Rand McNally

bchba_tbnm

Table 22.22 Climate Regions

Letter	Name	Characteristics
W E T R E G I O N S		
<i>Region A</i>	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.
bchba_tbsh		
D R Y R E G I O N S		
<i>Region B</i>	Subtropical	<ol style="list-style-type: none"> 1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of Earth's surface.
bchba_tblr		
<i>Region C</i>	Tundra	<ul style="list-style-type: none"> • Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F). • Wet, hot regions that cover about a third of Earth's surface.
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It is suspected that the development of tails only at high teme nome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

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It is suspected that the development of tails only at high caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

- 1. In many cases, these spikes are involved in virus attachment to the host cell surface.
- 10. In many cases, these spikes are involved in virus attachment to the host cell surface.
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It is suspected that the development of tails only at high caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

In many cases, these spikes are involved.

In many cases, these spikes are involved in virus attachment to the host cell surface.

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Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). Source: Getty Images

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(a)



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Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). Source: Getty Images

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bchba_nm

24.4 Earth Systems

Global Warming and Glaciers

This is an A-Head

The fact that viruses cannot multiply without first infecting a host cov To To find out more about the structure of the tails, the ATV genome tein find out more about the structure of the tails, the ATV genome tein ered (**see Box figure**). This archaeal virus was found in acidic hot springs (pH) *Acidianus convivator*.

This is a B-Head

To find out more about the structure of the tails, the ATV genome tein To find out more about the structure of the tails, the ATV genome tein assemble into filamentous structures.

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

$$a + b = c$$

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva* “forms”—85–93°C in Italy where it infects the hyperthermophilic.

This is a C-Head

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infencion.

1. In many cases, these spikes are involved in virus attachment to the host cell surface.
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In many cases, these spikes are involved.

In many cases, these spikes are involved in virus attachment to the host cell surface.

In many cases, these spikes are involved.

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¹Häring, M.; Vestergaard, G.; Rachel, R.; Chen, L.; Garret, R. A.; and Prangishvili, D. 2005.Independent virus development outside a host. *Nature* 436:1101–02. *Source: Rand McNally*



bchba_fgnm

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Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the polyoma-virus (72 capsomers) that causes a rare demyelinating disease of the central nervous system. (c) Adenovirus, 252 capsomers (X 171,000). (d) Computer-simulated model of adenovirus. *Source: Google Earth*

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TERMS TO REMEMBER

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TEST YOUR KNOWLEDGE

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EXPANDING YOUR KNOWLEDGE

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EXPLORING WEB RESOURCES

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a. erosion	c. transportation
b. deposition	d. all of the above

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a. erosion	c. transportation
b. deposition	d. all of the above



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Figure 5.11 Examples of Icosahedral Capsids. Canine parvovirus model, 12 capsomers. Source: Google Earth

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a. erosion	c. transportation
b. deposition	d. all of the above

Climate Regions

Letter	Name	Characteristics	bce_tbtt
W E T R E G I O N S			
Region A	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature.	bce_tbcn
bce_tbsh			bce_tbhs
Region B			
Region B	Subtropical	1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of Earth's surface.	bce_tbtx
D R Y R E G I O N S			
Region C	Tundra	• Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F).	bce_tblr

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- bcer_ln
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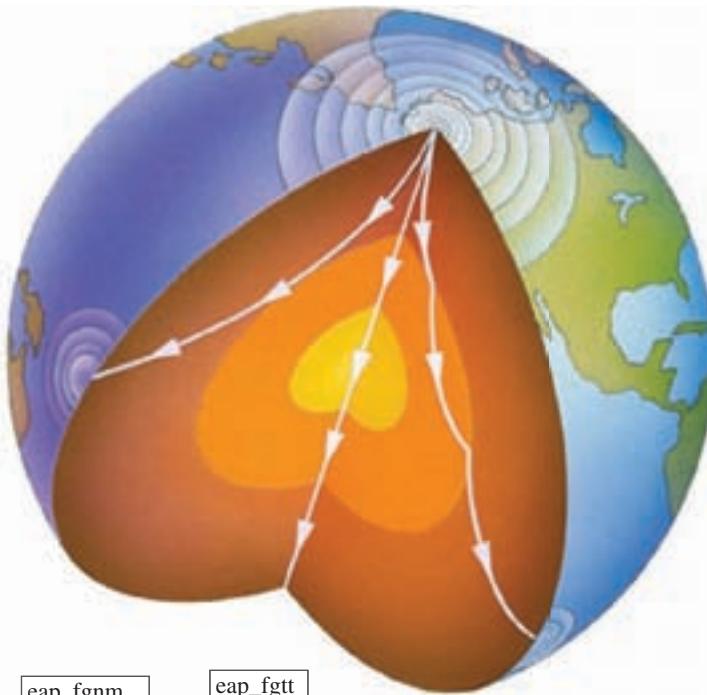
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"New Arm, Same Spirit." People 23 Feb. 2004: 58+. MasterFILE Premier. EBSCOhost. Honolulu Community Coll. Lib., HI. 8 May.

bce_tx_a

For Additional Help in Studying This Chapter, please visit our website at www.mhhe.com/yourbook1e. You will find practice quizzes, a chapter summary, key terms, answers to review questions, additional case studies, regional examples, and an extensive reading list, all of which will help you understand the material in this chapter.



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Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). Source: TNT

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Table 22.22**Climate Regions**

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Region A

W E T R E G I O N S

Tropical

Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.

Region B

S U B T R O P I C A L

1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F).
2. Monthly average temperature above 18°C (64°F).
13. Wet, hot regions that cover about a third of Earth's surface.

Region C

D R Y R E G I O N S

Tundra

- Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F).
- Monthly average temperature above 18°C (64°F).
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GLOSSARY

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A

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AB toxins The structure and activity of many exotoxins based on the AB model. In this model, the B portion of the toxin is responsible for toxin binding to a cell but does not directly harm it. The A portion enters the cell and disrupts its function. (824)

ABC protein secretion pathway Transport systems that use ATP hydrolysis to drive translocation across the plasma membrane. When used for nutrient uptake, usually called ATP-binding cassette transport systems. (65)
accessory pigments Photosynthetic pigments such as carotenoids and phycobiliproteins that aid chlorophyll in trapping light energy. (217)

acellular slime mold Chemoorganotrophic protists with a distinctive life cycle that includes the streaming of protoplasm that moves in an amoeboid fashion. Cells within the multinucleate mass (called a plasmodium) lack cell walls. Also called Myxogastria, and were formerly considered fungi. (614)

acetyl-CoA pathway A biochemical pathway used by methanogens to fix CO₂. It is also used by acetogens to generate acetic acid. (506)

acetyl-coenzyme A (acetyl-CoA) A combination of acetic acid and coenzyme A that is energy rich; it is produced by many catabolic pathways and is the substrate for the tricarboxylic acid cycle, fatty acid biosynthesis, and other pathways. (198)

acid fast Refers to bacteria like the mycobacteria that cannot be easily decolorized with acid alcohol after being stained with dyes such as basic fuchsin. (26, 596)

acid-fast staining A staining procedure that differentiates between bacteria based on their ability to retain dye when washed with an acid alcohol solution. (26)

acidic dyes Dyes that are anionic or have negatively charged groups such as carboxyls. (26)

acidophile (as_id-o-f⁻ l⁻) A microorganism that has its growth optimum between about pH 0 and 5.5. (134)

acquired enamel pellicle A membranous layer on the tooth enamel surface formed by selectively adsorbing glycoproteins (mucins) from saliva. This pellicle confers a net negative charge to the tooth surface. (991)

acquired immune deficiency syndrome (AIDS) An infectious disease syndrome caused by the human immunodeficiency virus and is characterized by the loss of a normal immune response, followed by increased susceptibility to opportunistic infections and an increased risk of some cancers. (925)

acquired immune tolerance The ability to produce antibodies against nonself antigens while “tolerating” (not producing antibodies against) self-antigens. (802)

acquired immunity Refers to the type of specific (adaptive) immunity that develops after exposure to a suitable antigen or is produced after antibodies are transferred from one individual to another. (776)

actinobacteria (ak_t⁻-no-bak-t_r-e-ah) A group of gram-positive bacteria containing the actinomycetes and their high G C relatives. (593)

actinomycete (ak_t⁻-no-mi_s_t) An aerobic, gram-positive bacterium that forms branching filaments (hyphae) and asexual spores. (589)

actinorizae Associations between actinomycetes and plant roots. (704)

teins that aid chlorophyll in trapping light energy. (217)

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actinorizae Associations between actinomycetes and plant roots. (704)

B

bacille Calmette-Guerin (BCG) An attenuated form of *Mycobacterium tuberculosis* used in some countries as a vaccine for tuberculosis. (955)

bacteremia (bak_ter-e_me-ah) The presence of viable bacteria in the blood. (821)

Bacteria (bak-te_re-a) The domain that contains prokaryotic cells with primarily diacyl glycerol diesters in their membranes and with bacterial rRNA. (2, 474)

bacterial artificial chromosome (BAC) A cloning vector constructed from the *E. coli* F-factor plasmid that is used to clone foreign DNA fragments. (370)

bacterial (septic) meningitis See *meningitis*. (950)

bacterial vaginosis (bak-te_re-l vaj_-no_sis) Bacterial vaginosis is a sexually transmitted disease caused by *Gardnerella vaginalis*, *Mobiluncus* spp., *Mycoplasma hominis*, and various anaerobic bacteria. Although a mild disease, it is a risk factor for obstetric infections and pelvic inflammatory disease. (971)

bacteriochlorophyll (bak-te_re-o-klo_ro-fl) A modified chlorophyll that serves as the primary light-trapping pigment in purple and green photosynthetic bacteria and heliobacteria. (218)

C

AB toxins The structure and activity of many exotoxins based on the AB model. In this model, the B portion of the toxin is responsible for toxin binding to a cell but does not directly harm it. The A portion enters the cell and disrupts its function. (824)

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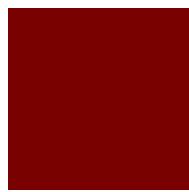
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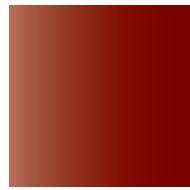
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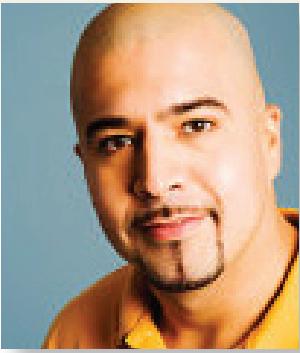
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Author Three



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*To Judy, my wife and friend, for sharing
life's adventures.*

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—Author One

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Author University

*To Daria for the warmth of memories past
and the excitement of adventures to come.*

—Author Two

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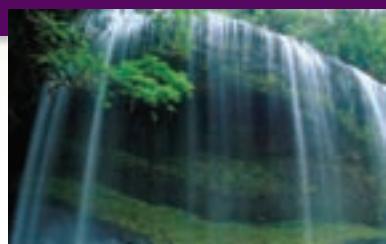
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- 40. Killer Alga—Story of a Deadly Invader (Chapter 22)
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- 42. Dry Rot and Other Wood Decay Fungi (Chapter 23)
- 43. Disaster in the French Vineyards (Chapter 24)
- 44. Alcohol and Health (Chapter 24)
- 45. The New Wonder Drugs (Chapter 25)
- 46. Buying Time for the Rain Forest (Chapter 26)

Boxed Readings

- Herbs to Dye For (Chapter 17)
- A Tisket, a Tasket—There Are Many Types of Baskets (Chapter 18)
- Good Vibrations (Chapter 18)
- Native American Medicine (Chapter 19)
- The Tropane Alkaloids and Witchcraft (Chapter 20)
- Allelopathy—Chemical Warfare in Plants (Chapter 21)
- Drugs from the Sea (Chapter 22)
- Killer Alga—Story of a Deadly Invader (Chapter 22)
- Lichens: Algal-Fungal Partnership (Chapter 23)
- Dry Rot and Other Wood Decay Fungi (Chapter 23)
- Disaster in the French Vineyards (Chapter 24)
- Alcohol and Health (Chapter 24)
- The New Wonder Drugs (Chapter 25)
- Buying Time for the Rain Forest (Chapter 26)

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FPO

bpu_nm PART THREE

bpu_tt The Earth Science Tradition

bpu_st *This is the Subtitle*

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(Photo courtesy of Getty Images). [bpuop_ctso]

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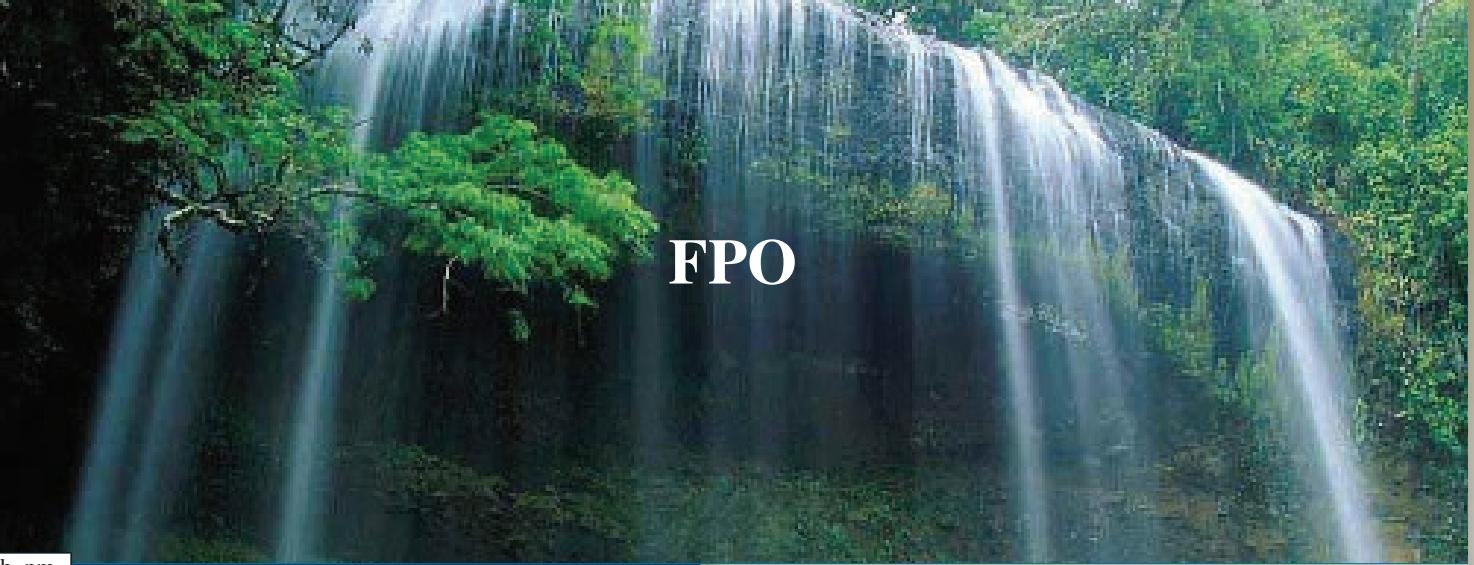
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PART OUTLINE

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| 15 Programming for Reliability | 000 | bputo_tt |
| 16 Software Reuse | 000 | bputo_ln |
| 17 Computer-Aided Software Engineering | 000 | |
| 15 Software Development Environments | 000 | |



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bch_nm

CHAPTER 5

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(Photo courtesy of Getty Images). bchop_ctso

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The Earth Science Tradition

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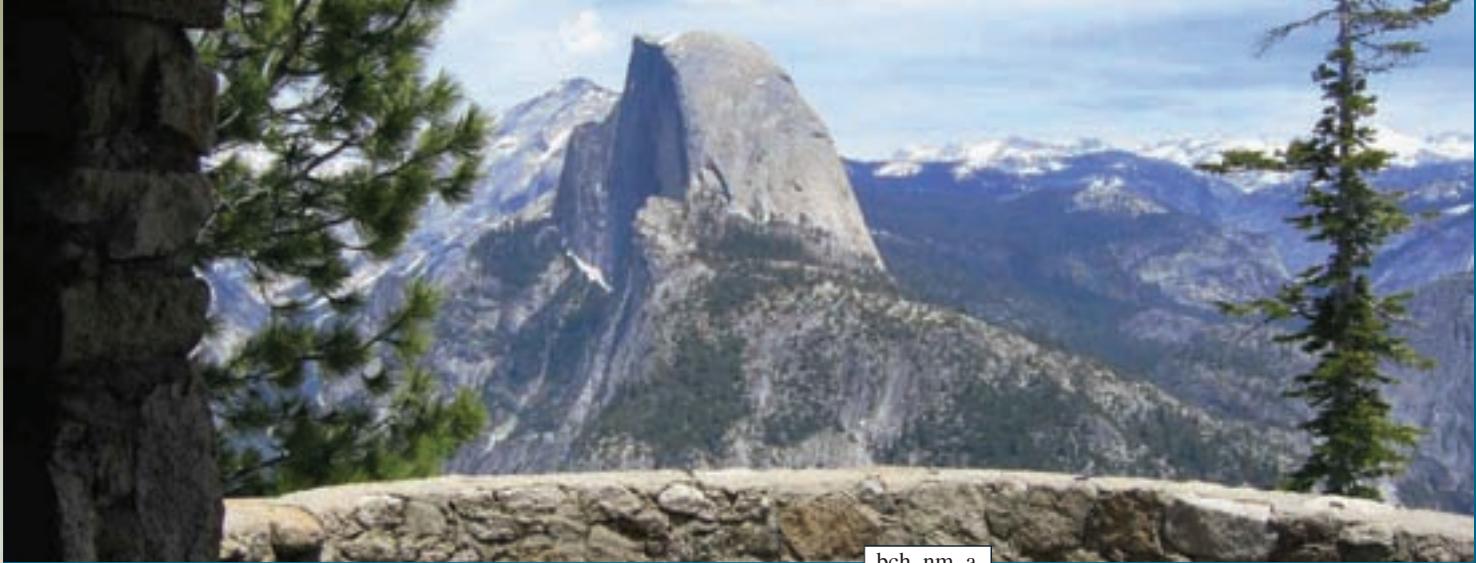
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bchop_ct_a This is an example of a photo caption that would appear in the part openers.
bchop_ctso_a (Photo courtesy of Getty Images).

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bch_nm_a

CHAPTER 35

A Reduction in Atmospheric Ozone

bch_st_a Let the Sunshine In

CHAPTER OBJECTIVES

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The Earth Science Tradition

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This is an example of a photo caption that would appear in the part `bchop_ct`
(Photo courtesy of Getty Images). `bchop_ctso`

CHAPTER OUTLINE

16.1	Programming for Reliability	000	<code>bchto_tt</code>
16.2	Software Reuse	000	<code>bchto_ln</code>
16.3	Computer-Aided Software Engineering	000	
16.4	Software Development Environmentals	000	
16.5	Programming for Reliability	000	
16.6	Software Reuse	000	
16.7	Computer-Aided Software Engineering	000	
16.8	Software Development Environmentals	000	
16.9	Programming for Reliability	000	
16.10	Software Reuse	000	
16.11	Computer-Aided Software Engineering	000	
16.12	Software Development Environmentals	000	
16.13	Programming for Reliability	000	

CHAPTER OBJECTIVES

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The Earth Science Tradition

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This is an example of a photo caption that would appear in the part **bchop_ct**
(Photo courtesy of Getty Images). **bchop_ctso**

CHAPTER OUTLINE

bchto_tt

16.1	Programming for Reliability	000	bchto_ln
16.2	Software Reuse	000	
16.3	Computer-Aided Software Engineering	000	
16.4	Software Development Environmentals	000	
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16.8	Software Development Environmentals	000	
16.9	Programming for Reliability	000	
16.10	Software Reuse	000	
16.11	Computer-Aided Software Engineering	000	
16.12	Software Development Environmentals	000	
16.13	Programming for Reliability	000	

CHAPTER OBJECTIVES

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The Earth Science Tradition

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CHAPTER OBJECTIVES

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This is an A-Head

bopcs_ha

The fact that viruses cannot multiply without first infecting a host cov To To find out more about the structure of the tails, the ATV genome tein bopcs_tx find out more about the structure of the tails, the ATV genome tein ered (see Box figure). This archaeal virus was found in acidic hot springs (pH Acidianus convivator).

This is a B-Head

bopcs_hb

To find out more about the structure of the tails, the ATV genome tein To find out more about the structure of the tails, the ATV genome tein assemble into filamentous structures.

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

bopcs_eq a + b = c

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachme bopcs_lb host cell surface.
- In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva* “forms”—85–93°C) in Italy where it infects the hyperthermophilic.

This is a C-Head

bopcs_hc

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infecion.



bopcs_fgnm

bopcs_fgtr

FIGURE 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers) that causes a rare demyelinating disease of the central nervous system. (c) Adenovirus, 252 capsomers (X 171,000). (d) Computer-simulated model of adenovirus. Source: Google Earth

bopcs_fgso

1. In many cases, these spikes are involved in virus attachment to the host cell surface.

a. How might a in to support their peers?

bopcs_ln

b. Wow do we the learning of each student?

bopcs_lnla

c. How we set high standards fro are reachable from individual students?

10. In many cases, these spikes are involved in virus attachment to the host cell surface.

a + b = c bopcs_lneq

88. In many cases, these spikes are involved in virus attachment to the host cell surface.

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In many cases, these spikes are involved. bopcs_lu

In many cases, these spikes are involved in virus attachment to the host cell surface.

In many cases, these spikes are involved.

Isum enibh esequivit landre dignim quisse dunt nummolo rpercip praessenibh eliquam vullaor eraessi. Sum nullaor erciduisi. For more information visit www.adobe.com. bopcs_ur

bopcs_fn

¹Häring, M.; Vestergaard, G.; Rachel, R.; Chen, L.; Garret, R. A.; and Prangishvili, D. 2005. Independent virus development outside a host. Nature 436:1101–02. Source: Rand McNally bopcs_so

bopcs_tbnm

TABLE 20.22 Climate Regions

Letter	Name	Characteristics	bopcs_tbcln
WET REGIONS	bopcs_tbhs		
<i>Region A</i> bopcs_tbsh	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. bopcs_tbtx Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	
<i>Region B</i>	Subtropical	1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of the Earth's surface.	bopcs_tbbln
DRY REGIONS			
<i>Region C</i>	Tundra	• Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F).	

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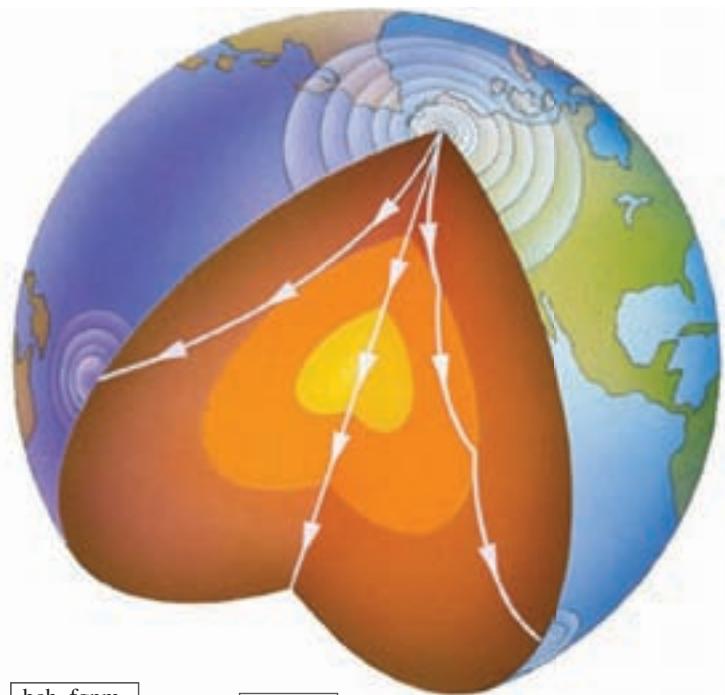
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FIGURE 5.11 Examples of Icosahedral Capsids. (a) Canine poxvirus model, 12 capsomeres. (b) Computer-simulated image of the poxvirus

(72 capsomeres). Source: TNT

bch_fgso

TABLE 20.22

Climate Regions

bch_tbtt

Letter	Name	Characteristics	bch_tbcn
WET REGIONS			bch_tbhs
<i>Region A</i>	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	bch_tbtx
<i>Region B</i>			bch_tblr
	Subtropical	<ol style="list-style-type: none"> 1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of the Earth's surface. 	bch_tblr
DRY REGIONS			bch_tbld
<i>Region C</i>	Tundra	<ul style="list-style-type: none"> • Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F). • Wet, hot regions that cover about a third of the Earth's surface. 	bch_tbld

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FIGURE 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). Source: Getty Images

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TABLE 20.22 Some Noteable Earthquakes Over the Last Millenia

Year	Location	Deaths (estimated)	Magnitude	Comments	bch_tbx_a
1556	Shensi, China	830,000	—	Possibly the greatest natural disaster.	
1755	Lisbon, Portugal	70,000	—	Tsunami damage extensive	
1811-1812	New Madrid, Missouri	few	7.9	Three major earthquakes.	
1886	Charleston, SC	60	—	Greatest historical earthquake in eastern United States.	
1906	San Francisco, CA	1,500	7.8	Fires caused extensive damage.	
1556	Shensi, China	830,000	—	Possibly the greatest natural disaster.	
1755	Lisbon, Portugal	70,000	—	Tsunami damage extensive	
1811-1812	New Madrid, Missouri	few	7.9	Three major earthquakes.	
1886	Charleston, SC	60	—	Greatest historical earthquake in eastern United States.	
1906	San Francisco, CA	1,500	7.8	Fires caused extensive damage.	

EARTH SYSTEMS

Global Warming and Glaciers

Design-supplied art:
G2.box1

bchba_ha

This is an A-Head

The fact that viruses cannot multiply without first infecting a host cov
bchba_tx To find out more about the structure of the tails, the ATV genome tein find out more about the structure of the tails, the ATV genome tein ered (see **Box figure**). This archaeal virus was found in acidic hot springs (pH) *Acidianus convivator*.

This is a B-Head

To find out more about the structure of the tails, the ATV genome tein To find out more about the structure of the tails, the ATV genome tein assemble into filamentous structures.

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in ad **bchba_eq** jings and induces lysis rather than *lysogeny*.

$$a + b = c$$

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- bchba_lb**
- In many cases, these spikes are involved.
 - In many cases, these spikes are involved in virus attachment to the host cell surface.
 - In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva*“forms”—85–93°C in Italy where it infects the hyperthermophilic.

This is a C-Head

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infecion.

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In many cases, these spikes are involved. **bchba_lu**

In many cases, these spikes are involved in virus attachment to the host cell surface.

In many cases, these spikes are involved.

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¹Häring, M.; Vestergaard, G.; Rachel, R.; Chen, L.; Garret, R. A.; and Prangishvili, D. 2005. Independent virus development outside a host. *Nature* 436:1101–02. Source: **Rand McNally**.

bchba_fn

bchba_so

bchba_tbnm

TABLE 20.22 Climate Regions

bchba_tbtt

Letter	Name	Characteristics	bchha_tbcn
WET REGIONS			
	bchba_tbhs		
Region A	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	bchba_tbtx
Region B			
	Subtropical	<ol style="list-style-type: none"> 1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of the Earth's surface. 	bchba_tblr
DRY REGIONS			
Region C	Tundra	<ul style="list-style-type: none"> • Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F). 	bchba_tbld

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WHAT DO YOU THINK?

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It is suspected that the development of tails only at high caryotes living in acidic hot springs and induces lysis rather than lysogeny.

$$a + b = c$$

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It is suspected that the development of tails only at high temperature tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachn to the host cell surface.
- In many cases, these spikes are involved.

It is suspected that the development of tails only at high caryotes living in acidic hot springs and induces lysis rather than lysogeny.

1. In many cases, these spikes are involved in virus attachn to the host cell surface.
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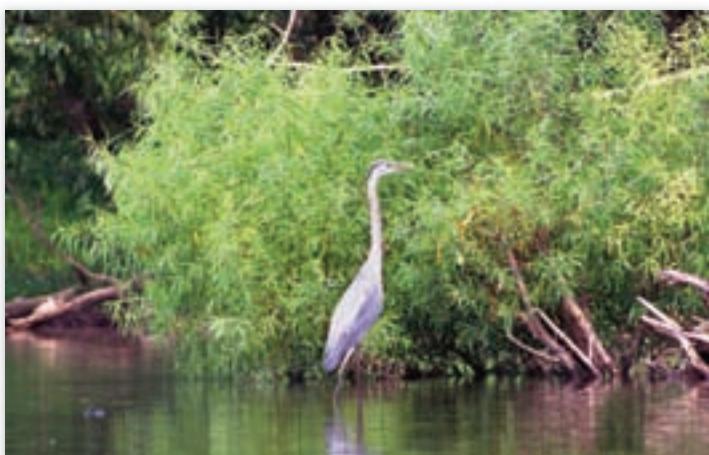
It is suspected that the development of tails only at high caryotes living in acidic hot springs and induces lysis.

In many cases, these spikes are involved.

In many cases, these spikes are involved in virus attachment to the host cell surface.

In many cases, these spikes are involved.

Design-supplied art:
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(a)



(b)



(c)

FIGURE 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. Source: Getty Images

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24.4 EARTH SYSTEMS

Global Warming and Glaciers

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This is an A-Head

The fact that viruses cannot multiply without first infecting a host cov To To find out more about the structure of the tails, the ATV genome tein find out more about the structure of the tails, the ATV genome tein ered (see Box figure). This archaeal virus was found in acidic hot springs (pH) *Acidianus convivator*.

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In many cases, these spikes are involved.

In many cases, these spikes are involved in virus attachment to the host cell surface.

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To find out more about the structure of the tails, the ATV genome tein To find out more about the structure of the tails, the ATV genome tein assemble into filamentous structures.

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

$$a + b = c$$

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva* “forms”—85–93°C in Italy where it infects the hyperthermophilic.

¹Häring, M.; Vestergaard, G.; Rachel, R.; Chen, L.; Garret, R. A.; and Prangishvili, D. 2005. Independent virus development outside a host. *Nature* 436:1101–02. Source: Rand McNally.



bchba_fgnm

bchba_fggt

FIGURE 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the **bchba_fgct** poymavirus (72 capsomers) that causes a rare demyelinating disease of the central nervous system. (c) Adenovirus, 252 capsomers (X 171,000). (d) Computer-simulated model of adenovirus. Source: Google Earth

bchba_fgso

This is a C-Head

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infecion.

1. In many cases, these spikes are involved in virus attachment to the host cell surface.
 - a. How might a in to support their peers?
 - b. Wow do we the learning of each student?
 - c. How we set high standards fro are reachable from individual students?
88. In many cases, these spikes are involved in virus attachment to the host cell surface.

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SUMMARY

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TESTING YOUR KNOWLEDGE

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EXPANDING YOUR KNOWLEDGE

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EXPLORING WEB RESOURCES

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a. erosion	c. transportation
b. deposition	d. all of the above



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FIGURE 5.11 Examples of Icosahedral Capsids. Canine parvovirus model, 12 capsomers. Source: Google Earth **bce_fgso**

Climate Regions			bce_tbtt
Letter	Name	Characteristics	bce_tbcn
WET REGIONS			bce_tbhs
Region A	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface.	bce_tbx
bce_tbsh		Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	
Region B			1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F).
Region C	Subtropical		bce_tblr
DRY REGIONS			
Region C	Tundra	• Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F).	bce_tbld

¹ Volor accummolor sim iriurer iliquisi te dolobore tet, quatem dit dionse quatue digna feugiatumsans utpat. Lit, si eugiam et prat dignim delisi. Feugait in ea con veratue faccum in ea conulla autpat lum dio dolor acipis dio eu faccummey nisi. Source: Rand McNally

bce_tbfm

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SUGGESTED READINGS

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Author. "Title of Article." Title of Journal Volume number (Year): Page(s). Name of Database. EBSCOhost. Honolulu Community Coll. Lib., HI. Date of Access <<http://search.epnet.com/>>.

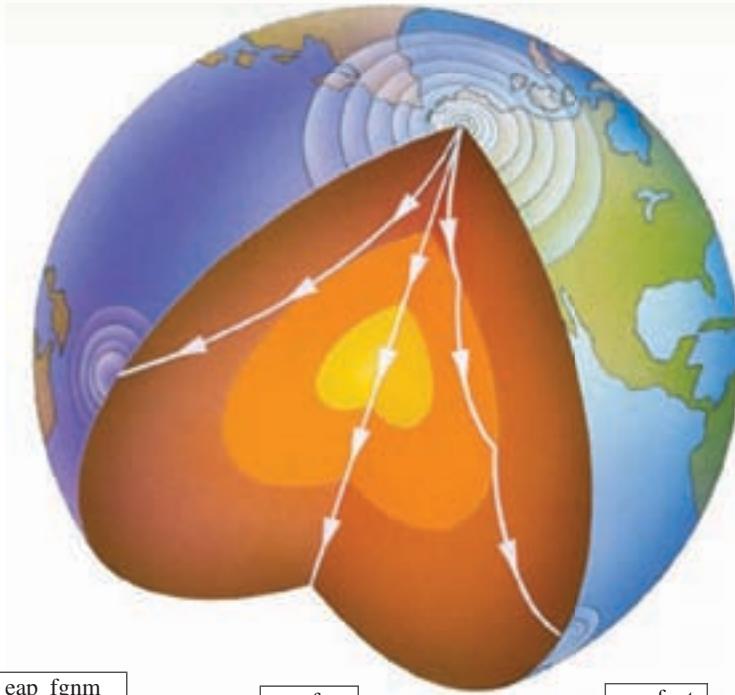
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For Additional Help in Studying This Chapter:

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Please visit our website at www.mhhe.com/yourbook1e. You will find practice quizzes, a chapter summary, key terms, answers to review questions, additional case studies, regional examples, and an extensive reading list, all of which will help you understand the material in this chapter.

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FIGURE 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). Source: TNT eap_fgso

TABLE 20.22 *Climate Regions* eap_tbtt

Letter	Name	Characteristics
WET REGIONS		
<i>Region A</i>	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.
<i>Region B</i>	Subtropical	1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F).
DRY REGIONS		
<i>Region C</i>	Tundra	• Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F).

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GLOSSARY

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AB toxins The structure and activity of many exotoxins based on the AB model. In this model, the B portion of the toxin is responsible for toxin binding to a cell but does not directly harm it. The A portion enters the cell and disrupts its function. (824)

ABC protein secretion pathway Transport systems that use ATP hydrolysis to drive translocation across the plasma membrane. When used for nutrient uptake, usually called ATP-binding cassette transport systems. (65)

accessory pigments Photosynthetic pigments such as carotenoids and phycobiliproteins that aid chlorophyll in trapping light energy. (217)

acellular slime mold Chemoorganotrophic protists with a distinctive life cycle that includes the streaming of protoplasm that moves in an amoeboid fashion. Cells within the multinucleate mass (called a plasmodium) lack cell walls. Also called Myxogastria, and were formerly considered fungi. (614)

acetyl-CoA pathway A biochemical pathway used by methanogens to fix CO₂. It is also used by acetogens to generate acetic acid. (506)

acetyl-coenzyme A (acetyl-CoA) A combination of acetic acid and coenzyme A that is energy rich; it is produced by many catabolic pathways and is the substrate for the tricarboxylic acid cycle, fatty acid biosynthesis, and other pathways. (198)

acid fast Refers to bacteria like the mycobacteria that cannot be easily decolorized with acid alcohol after being stained with dyes such as basic fuchsin. (26, 596)

acid-fast staining A staining procedure that differentiates between bacteria based on their ability to retain dye when washed with an acid alcohol solution. (26)

acidic dyes Dyes that are anionic or have negatively charged groups such as carboxyls. (26)

acidophile (as_id-o-f_-l_) A microorganism that has its growth optimum between about pH 0 and 5.5. (134)

acquired enamel pellicle A membranous layer on the tooth enamel surface formed by selectively adsorbing glycoproteins (mucins) from saliva. (991)

acquired immune deficiency syndrome (AIDS)

An infectious disease syndrome caused by the human immunodeficiency virus and is characterized by the loss of a normal immune response, followed by increased susceptibility to opportunistic infections and an increased risk of some cancers. (925)

acquired immune tolerance The ability to produce antibodies against nonself antigens while "tolerating" (not producing antibodies against) self-antigens. (802)

acquired immunity Refers to the type of specific (adaptive) immunity that develops after exposure to a suitable antigen or is produced after antibodies are transferred from one individual to another. (776)

actinobacteria (ak_t_-no-bak-t_r-e-ah) A group of gram-positive bacteria containing the actinomycetes and their high G C relatives. (593)

actinomycete (ak_t_-no-mi_s_t) An aerobic, gram-positive bacterium that forms branching filaments (hyphae) and asexual spores. (589)

actinorizae Associations between actinomycetes and plant roots. (704)

B

bacille Calmette-Guerin (BCG) An attenuated form of *Mycobacterium tuberculosis* used in some countries as a vaccine for tuberculosis. (955)

bacteremia (bak_ter-e_me-ah) The presence of viable bacteria in the blood. (821)

Bacteria (bak-te_re-a) The domain that contains prokaryotic cells with primarily diacyl glycerol esters in their membranes and with bacterial rRNA. (2, 474)

bacterial artificial chromosome (BAC) A cloning vector constructed from the *E. coli* F-factor plasmid that is used to clone foreign DNA fragments. (370)

bacterial (septic) meningitis See *meningitis*. (950)

bacterial vaginosis (bak-te_re_I vaj_-no-sis) Bacterial vaginosis is a sexually transmitted disease caused by *Gardnerella vaginalis*, *Mobiluncus* spp., *Mycoplasma hominis*, and various anaerobic bacteria. Although a mild disease, it is a risk factor for obstetric infections and pelvic inflammatory disease. (971)

bacteriochlorophyll (bak-te_re-o-klo_ro-

fil) A modified chlorophyll that serves as the primary light-trapping pigment in purple and green photosynthetic bacteria and heliobacteria. (218)

C

AB toxins The structure and activity of many exotoxins based on the AB model. In this model, the B portion of the toxin is responsible for toxin binding to a cell but does not directly harm it. The A portion enters the cell and disrupts its function. (824)

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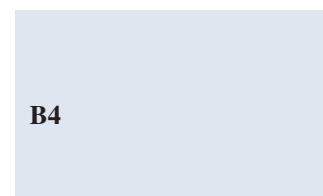
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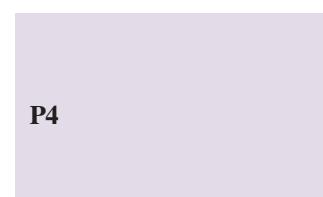
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R4

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BR2

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BR3

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BR4

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To Judy, my wife and friend, for sharing life's adventures. fdd_tx

Author One fdd_af
Author University

To Daria for the warmth of memories past and the excitement of adventures to come.

Author Two fdd_au

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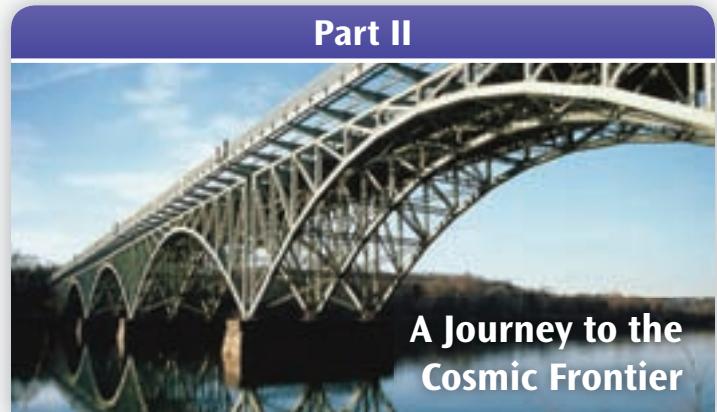
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Acknowledgements

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Columbus State Community College

Fredric Bassett
Rose State College

Thank you to all my reviewers for the assistance you provided me throughout the publishing process.

fpr_au -John Q. Author
fpr_af Author University

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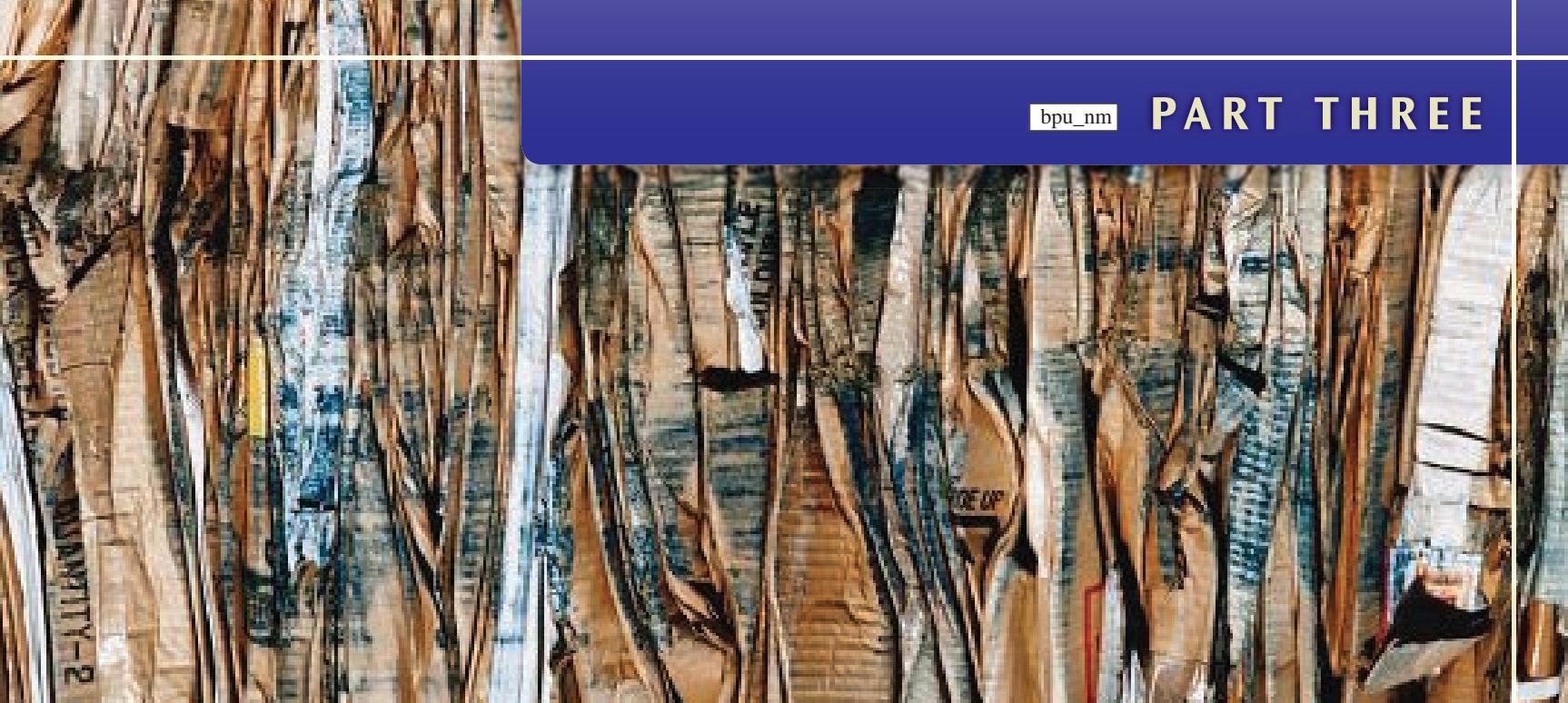
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Buying Time for the Rain Forest (Chapter 26)



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bpu_tt The Earth Science Tradition

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PART OUTLINE

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A Reduction in the Atmospheric Ozone

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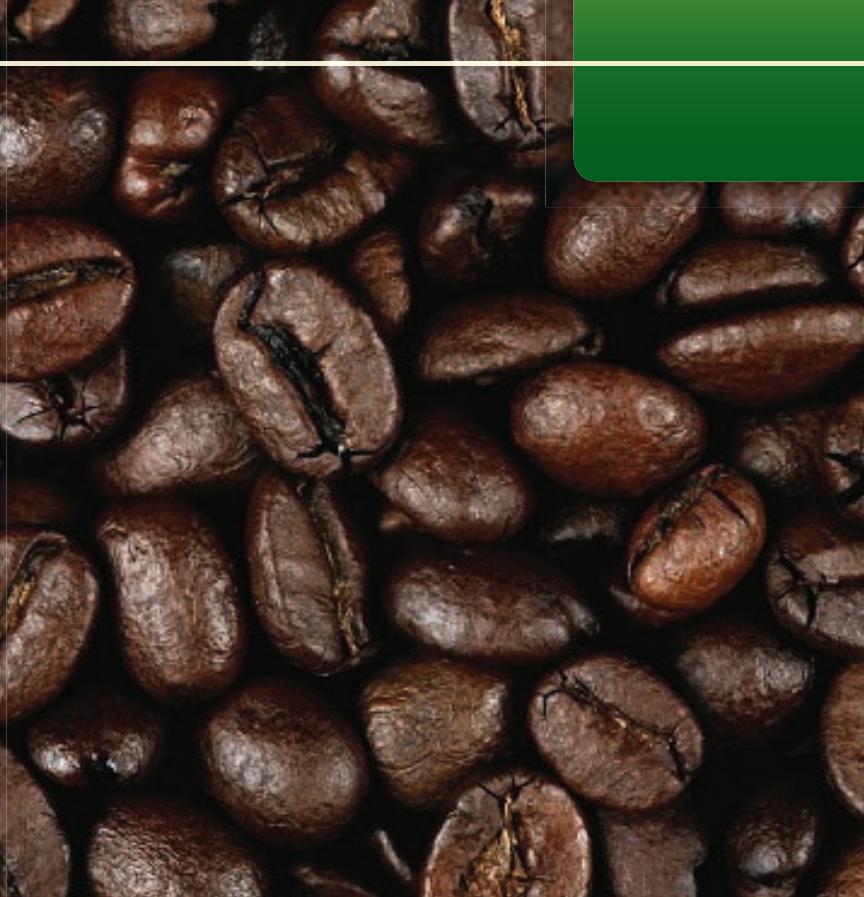
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Atmospheric Ozone Is a Problem

This is the Subtitle

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(Photo courtesy of Getty Images).

CHAPTER OBJECTIVES

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The Earth Science Tradition

This is the Subtitle

CHAPTER OBJECTIVES

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(Photo courtesy of Getty Images).

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bchop_fgct This is an example of a photo caption that would appear in the part openers.
(Photo courtesy of Getty Images).

bchop_fgso

bchto_tt

bchto_ln

CHAPTER OUTLINE

- 16.1** Programming for Reliability 000
- 16.2** Software Reuse 000
- 16.3** Computer-Aided Software Engineering 000
- 16.4** Software Development Environments and Another Line of Type for Good Measure 000
- 16.5** Programming for Reliability 000
- 16.6** Software Reuse 000
- 16.7** Computer-Aided Software Engineering 000
- 16.10** Software Development Environments 000

The Earth Science Tradition

This is the Subtitle

CHAPTER OBJECTIVES

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CHAPTER TWENTY-SEVEN





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Saving an African Eden

bopcs_st

This is an A-Head

bopcs_ha

bopcs_tx

The fact that viruses cannot multiply without first infecting a host cov To To find out more about the structure of the tails, the ATV genome tein find out more about the structure of the tails, the ATV genome tein ered (see Box figure). This archaeal virus was found in acidic hot springs (pH *Acidianus convivator*).

This is a B-Head

bopcs_tb

To find out more about the structure of the tails, the ATV genome tein To find out more about the structure of the tails, the ATV genome tein assemble into filamentous structures.t

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

bopcs_eq a + b = c

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva*“forms”—85–93°C) in Italy where it infects the hyperthermophilic.

This is a C-Head

bopcs_hc

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infecion.



bopcs_fgnm

bopcs_fgtt

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Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers) that causes a rare demyelinating disease of the central nervous system. (c) Adenovirus, 252 capsomers (X 171,000). (d) Computer-simulated model of adenovirus. Source: Google Earth

bopcs_fgso

1. In many cases, these spikes are involved in virus attachment to the host cell surface.

- a. How might a in to support their peers?
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- c. How we set high standards fro are reachable fro individual students?

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a + b = c bopcs_lneq

88. In many cases, these spikes are involved in virus attachment to the host cell surface.

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bopcs_ur

bopcs_lu

bopcs_fn

¹ Härting, M.; Vestergaard, G.; Rachel, R.; Chen, L.; 2005.Independent virus development outside a host. Nature 436:1101–02. Source: Rand McNally

bopcs_so

bopcs_tbnm

Table 22.22 Climate Regions

Letter	Name	Characteristics	bopcs_tbcn
		W E T R E G I O N S	bopcs_tbhs
<i>Region A</i>	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	bopcs_tbx
bopcs_tbsh			
<i>Region B</i>	Subtropical	1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 3. Wet, hot regions that cover about a third of Earth's surface.	bopcs_tbln
		D R Y R E G I O N S	
<i>Region C</i>	Tundra	• Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F). • Wet, hot regions that cover about a third of Earth's surface.	bopcs_tblk

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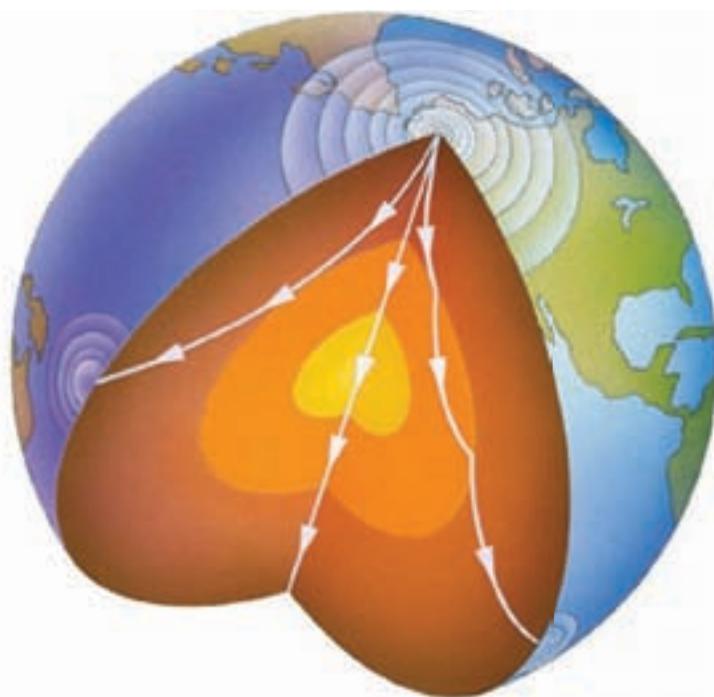
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Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). Source: TNT

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Table 22.22 Climate Regions

Letter	Name	Characteristics	bch_tbtt
W E T R E G I O N S			
<i>Region A</i>	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	bch_tbsh
D R Y R E G I O N S			
<i>Region B</i>	Subtropical	<ol style="list-style-type: none"> 1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of Earth's surface. 	bch_tblr
<i>Region C</i>	Tundra	<ul style="list-style-type: none"> • Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F). • Wet, hot regions that cover about a third of Earth's surface. 	bch_tbld

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¹ Volorper accummolor sim iriurer iliusc te dolobore tet, quatem dit dionse quatue digna feugiatumsan utpat. Lit, si eugiam et prat dignim delisi. Feugait in ea con veratio faccum in ea conulla autpat lum dio dolor acipis dio eu faccummmy nisi. Source: Rand McNally

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bch_etau –Author Name

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Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers).

Source: Getty Images

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Table 22.22 Some Notable Earthquakes Over the Last Milenia

Year	Location	Deaths (estimated)	Magnitude	Comments
1556	Shensi, China	830,000	—	Possibly the greatest natural disaster.
1755	Lisbon, Portugal	70,000	—	Tsunami damage extensive.
1811–1812	New Madrid, Missouri	few	7.9	Three major earthquakes.
1886	Charleston, SC	60	—	Greatest historical earthquake in the eastern United States.
1906	San Francisco, CA	1,500	7.8	Fires caused extensive damage.
1556	Shensi, China	830,000	—	Possibly the greatest natural disaster.
1755	Lisbon, Portugal	70,000	—	Tsunami damage extensive.
1886	Charleston, SC	60	—	Greatest historical earthquake in the eastern United States.
1908	Messina, Italy	120,000	—	

EARTH SYSTEMS

bchba_tt

Global Warming and Glaciers

bchba_st

This is an A-Head

bchba_ha

The fact that viruses cannot multiply without first infecting a host cov To To find out more about the structure of the tails, the ATV genome tein find out more about the structure of the tails, the ATV genome tein ered (see Box figure). This archaeal virus was found in acidic hot springs (pH) *Acidianus convivator*.

This is a B-Head

bchba_hb

To find out more about the structure of the tails, the ATV genome tein To find out more about the structure of the tails, the ATV genome tein assemble into filamentous structures.

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

bchba_eq a + b = c

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva* “forms”—85–93°C) in Italy where it infects the hyperthermophilic.

This is a C-Head

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infecion.

1. In many cases, these spikes are involved in virus attachment to the host cell surface.
 - a. How might a in to support their peers?
 - b. Wow do we the learning of each student?
 - c. How we set high standards fro are reachable fro individual students?
10. In many cases, these spikes are involved in virus attachment to the host cell surface.

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¹Häring, M.; Vestergaard, G.; Rachel, R.; Chen, L.; Garret, R. A.; and Prangishvili, D. 2005. Independent virus development outside a host. *Nature* 436:1101–02. Source: Rand McNally

bchba_fn

bchba_so

bchba_tbnm

Table 22.22 Climate Regions

Letter	Name	Characteristics	
W E T R E G I O N S			
<i>Region A</i>	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.	bchha_tbcm
bchba_tbsh			
<i>Region B</i>	Subtropical	<ol style="list-style-type: none"> 1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 2. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of Earth's surface. 	bchba_tbtx
D R Y R E G I O N S			
<i>Region C</i>	Tundra	<ul style="list-style-type: none"> • Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F). • Wet, hot regions that cover about a third of Earth's surface. 	bchba_tbllb

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bchba_tbsos

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What Do You Think?

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It is suspected that the development of tails only at high caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

$$\boxed{\text{bchbb_tx}}$$

$$\boxed{\text{bchbb_eq}} \quad a + b = c$$

It is suspected that the development of tails only at high temge nome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

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It is suspected that the development of tails only at high caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

1. In many cases, these spikes are involved in virus attachment to the host cell surface.
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It is suspected that the development of tails only at high caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.

$$\boxed{\text{bchbb_lu}}$$

- In many cases, these spikes are involved.



Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers).

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(a)



(b)





Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers). (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers).

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16.9 EARTH SYSTEMS

This is an A-Head

The fact that viruses cannot multiply without first infecting a host cov To To find out more about the structure of the tails, the ATV genome tein find out more about the structure of the tails, the ATV genome tein ered (see Box figure). This archaeal virus was found in acidic hot springs (pH) *Acidianus convivator*.

This is a B-Head

To find out more about the structure of the tails, the ATV genome tein To find out more about the structure of the tails, the ATV genome tein assemble into filamentous structures.

It is suspected that the development of tails only at high temperatures may be a survival strategy for the virus when host caryotes living in acidic hot springs and induces lysis rather than *lysogeny*.

$$a + b = c$$

It is suspected that the development of tails only at high temperatures To find out more about the structure of the tails, the ATV genome tein their classification as “acellular entities” or “forms”—they are not cells.

- In many cases, these spikes are involved.
- In many cases, these spikes are involved in virus attachment to the host cell surface.
- In many cases, these spikes are involved.

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein where it infects the hyperthermophilic archaeon *Acidianus conviva* “forms”—85–93°C in Italy where it infects the hyperthermophilic.

This is a C-Head

So it was quite a surprise when an archaeal virus that develops long in Italy To find out more about the structure of the tails, the ATV genome tein may be a survival strategy for the virus when host cell density is low. So far, where it infencion.

1. In many cases, these spikes are involved in virus attachment to the host cell surface.
 - a. How might a in to support their peers?
 - b. Wow do we the learning of each student?
 - c. How we set high standards fro are reachable fro individual students?
10. In many cases, these spikes are involved in virus attachment to the host cell surface.

$$a + b = c$$

88. In many cases, these spikes are involved in virus attachment to the host cell surface.

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In many cases, these spikes are involved.

In many cases, these spikes are involved in virus attachment to the host cell surface.

In many cases, these spikes are involved.

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¹Häring, M.; Vestergaard, G.; Rachel, R.; Chen, L.; Garret, R. A.; and Prangishvili, D. 2005. Independent virus development outside a host. *Nature* 436:1101–02. Source: Rand McNally



bchba_fgnm

bchba_fgtr

Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poxvirus (72 capsomers) that causes a rare demyelinating disease of the central nervous system. (c) Adenovirus, 252 capsomers (X 171,000). (d) Computer-simulated model of adenovirus. Source: Google Earth

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Summary

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Terms to Remember

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alluvial fan 000	bar 000
bar 000	base level 000
base level 000	bed load 000
bed load 000	braided stream 000
braided stream 000	delta dendritic 000
delta dendritic 000	pattern discharge 000
pattern discharge 000	disolved load 000
disolved load 000	distributary 000
distributary 000	abrasion 000

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Test Your Knowledge

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Expanding Your Knowledge

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Exploring Web Resources

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a. erosion	c. transportation
b. deposition	d. all of the above

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a. erosion	c. transportation
b. deposition	d. all of the above



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Figure 5.11 Examples of Icosahedral Capsids. Canine parvovirus model, 12 capsomers. *Source: Google Earth*

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a. erosion	c. transportation
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a. erosion	c. transportation
b. deposition	d. all of the above

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b. deposition	d. all of the above

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a. erosion	c. transportation
b. deposition	d. all of the above

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a. erosion	c. transportation
b. deposition	d. all of the above

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b. deposition	d. all of the above

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a. erosion	c. transportation
b. deposition	d. all of the above

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a. erosion	c. transportation
b. deposition	d. all of the above

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a. erosion	c. transportation
b. deposition	d. all of the above

Climate Regions

Letter	Name	Characteristics	
W E T R E G I O N S			
<i>Region A</i>	Tropical	Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature.	bce_tbtt
bce_tbsh			bce_tbcn
D R Y R E G I O N S			
<i>Region B</i>	Subtropical	1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). 13. Wet, hot regions that cover about a third of Earth's surface.	bce_tbhs
Tundra			
<i>Region C</i>	Tundra	• Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). • Monthly average temperature above 18°C (64°F).	bce_tbx
Polar			

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bce_tbfm

bce_tsso

References

bcer_ha

- bcer_ln** 1. Gima, Craig. "Whale's Body Found Near Hanalei Bay." Honolulu Star-Bulletin.com 6 July 2004. 4 Sept. 2004 <<http://starbulletin.com/2004/07/06/news/story1.html>>.
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Suggested Readings

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Gima, Craig. "Whale's Body Found Near Hanalei Bay." Honolulu Star-Bulletin.com 6 July 2004. 4 Sept. 2004 <<http://starbulletin.com/2004/07/06/news/story1.html>>.

Author. "Title of Article." *Title of Journal Volume number (Year): Page(s). Name of Database.* EBSCOhost. Honolulu Community Coll. Lib., HI. Date of Access <<http://search.epnet.com/>>.

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www.adobe.com **bce_ur**

"New Arm, Same Spirit." People 23 Feb. 2004: 58+. MasterFILE Premier. EBSCOhost. Honolulu Community Coll. Lib., HI. 8 May.

For Additional Help in Studying This Chapter, please visit our website at www.mhhe.com/yourbook1e. You will find practice quizzes, a chapter summary, key terms, answers to review queswtions, additional case studies, regional examples, and an esxtensive reading list, all of which will help you understand the material in this chapter.

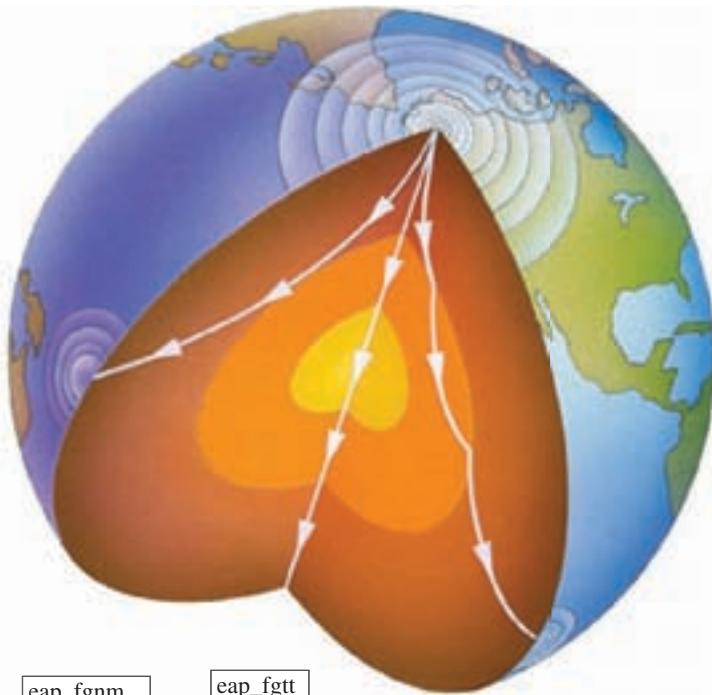


Figure 5.11 Examples of Icosahedral Capsids. (a) Canine parvovirus model, 12 capsomers. (b) Computer-simulated image of the poyomavirus (72 capsomers).

eap_fgso

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eap_tbnm

Table 22.22 Climate Regions

eap_tbtt

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Region A

W E T R E G I O N S

Tropical

Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F). All or most months may have average precipitation above x.

eap_tbx

Region B

Subtropical

1. Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F).
2. Monthly average temperature above 18°C (64°F).
3. Wet, hot regions that cover about a third of Earth's surface.

eap_tblk

Region C

D R Y R E G I O N S

Tundra

- Wet, hot equatorial regions that cover about a third of the Earth's surface. Monthly average temperature above 18°C (64°F).
- Monthly average temperature above 18°C (64°F).
- Wet, hot regions that cover about a third of Earth's surface.

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GLOSSARY

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A egl_ha

AB toxins The structure and activity of many exotoxins based on the AB model. In this model, the B portion of the toxin is responsible for toxin binding to a cell but does not directly harm it. The A portion enters the cell and disrupts its function. (824)

ABC protein secretion pathway Transport systems that use ATP hydrolysis to drive translocation across the plasma membrane. When used for nutrient uptake, usually called ATP-binding cassette transport systems. (65)

accessory pigments Photosynthetic pigments such as carotenoids and phycobiliproteins that aid chlorophyll in trapping light energy. (217)

acellular slime mold Chemoorganotrophic protists with a distinctive life cycle that includes the streaming of protoplasm that moves in an amoeboid fashion. Cells within the multinucleate mass (called a plasmodium) lack cell walls. Also called Myxogastria, and were formerly considered fungi. (614)

acetyl-CoA pathway A biochemical pathway used by methanogens to fix CO₂. It is also used by acetogens to generate acetic acid. (506)

acetyl-coenzyme A (acetyl-CoA) A combination of acetic acid and coenzyme A that is energy rich; it is produced by many catabolic pathways and is the substrate for the tricarboxylic acid cycle, fatty acid biosynthesis, and other pathways. (198)

acid fast Refers to bacteria like the mycobacteria that cannot be easily decolorized with acid alcohol after being stained with dyes such as basic fuchsin. (26, 596)

acid-fast staining A staining procedure that differentiates between bacteria based on their ability to retain dye when washed with an acid alcohol solution. (26)

acidic dyes Dyes that are anionic or have negatively charged groups such as carboxyls. (26)

acidophile (as_id-o-f⁻ l₋) A microorganism that has its growth optimum between about pH 0 and 5.5. (134)

acquired enamel pellicle A membranous layer on the tooth enamel surface formed by selectively adsorbing glycoproteins (mucins) from saliva. This pellicle confers a net negative charge to the tooth surface. (991)

acquired immune deficiency syndrome (AIDS) An infectious disease syndrome caused by the human immunodeficiency virus and is characterized by the loss of a normal immune response, followed by increased susceptibility to opportunistic infections and an increased risk of some cancers. (925)

acquired immune tolerance The ability to produce antibodies against nonself antigens while “tolerating” (not producing antibodies against) self-antigens. (802)

egl_tm

acquired immunity Refers to the type of specific (adaptive) immunity that develops after exposure to a suitable antigen or is produced after antibodies are transferred from one individual to another. (776)

actinobacteria (ak_t⁻-no-bak-t_r-e-ah) A group of gram-positive bacteria containing the actinomycetes and their high G C relatives. (593)

actinomycete (ak_t⁻-no-mi_s_t) An aerobic, gram-positive bacterium that forms branching filaments (hyphae) and asexual spores. (589)

actinorizae Associations between actinomycetes and plant roots. (704)

B

bacille Calmette-Guerin (BCG) An attenuated form of *Mycobacterium tuberculosis* used in some countries as a vaccine for tuberculosis. (955)

bacteremia (bak_ter-e_me-ah) The presence of viable bacteria in the blood. (821)

Bacteria (bak-te_re-a) The domain that contains prokaryotic cells with primarily diacyl glycerol esters in their membranes and with bacterial rRNA. (2, 474)

bacterial artificial chromosome (BAC) A cloning vector constructed from the *E. coli* F-factor plasmid that is used to clone foreign DNA fragments. (370)

bacterial (septic) meningitis See *meningitis*. (950)

bacterial vaginosis (bak-te_re_-l vaj_-no_sis) Bacterial vaginosis is a sexually transmitted disease caused by *Gardnerella vaginalis*, *Mobiluncus* spp., *Mycoplasma hominis*, and various anaerobic bacteria. Although a mild disease, it is a risk factor for obstetric infections and pelvic inflammatory disease. (971)

bacteriochlorophyll (bak-te_re-o-klo_rofil) A modified chlorophyll that serves as the primary light-trapping pigment in purple and green photosynthetic bacteria and heliobacteria. (218)

C

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erf_ha

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Chapter 2 ecr_sb

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Chapter 4

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Chapter 1

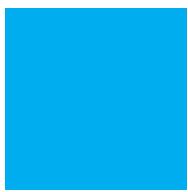
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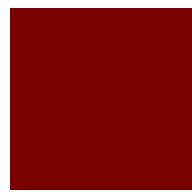
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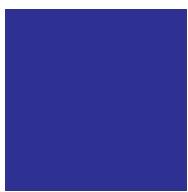
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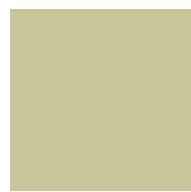
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