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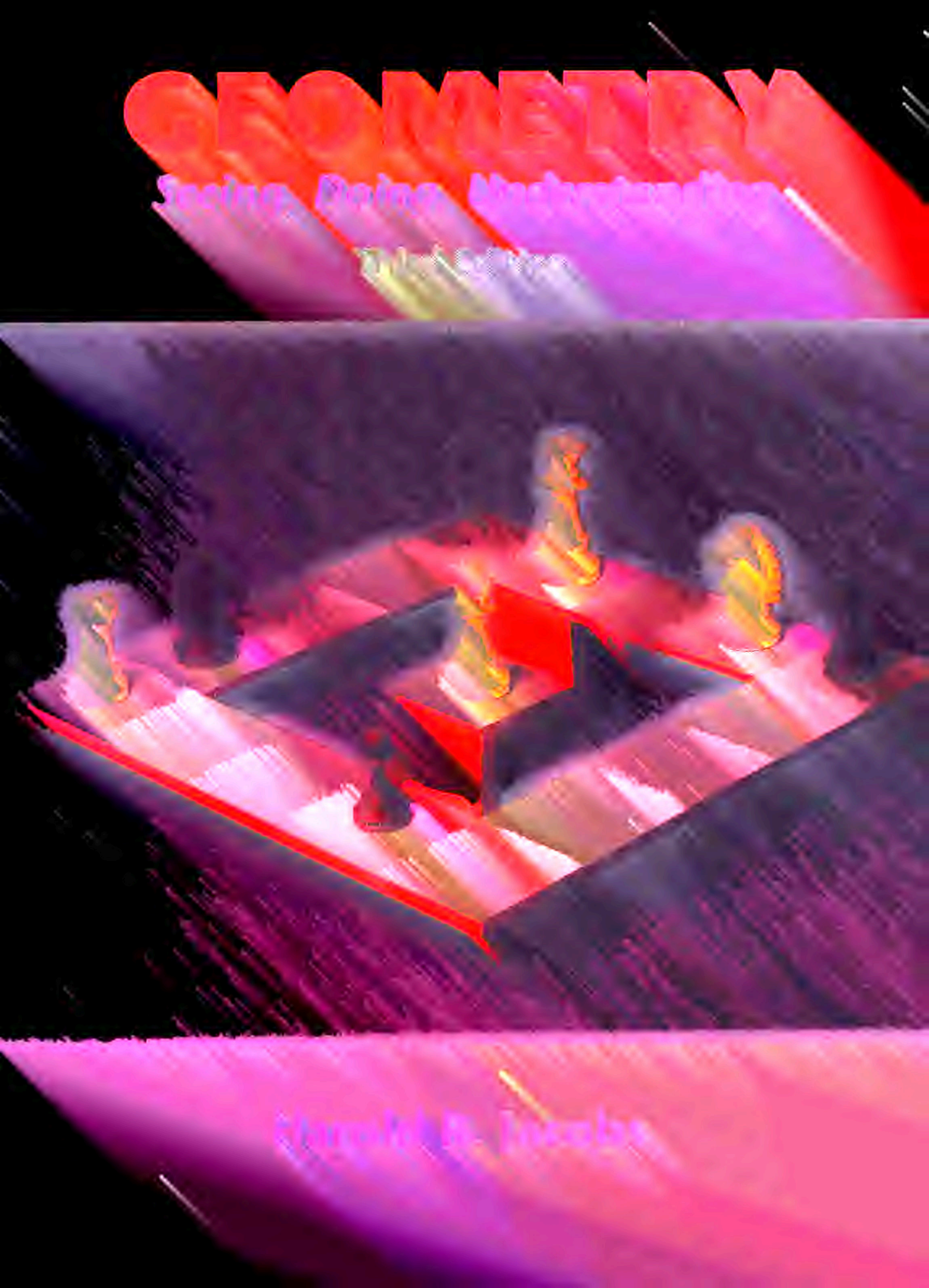

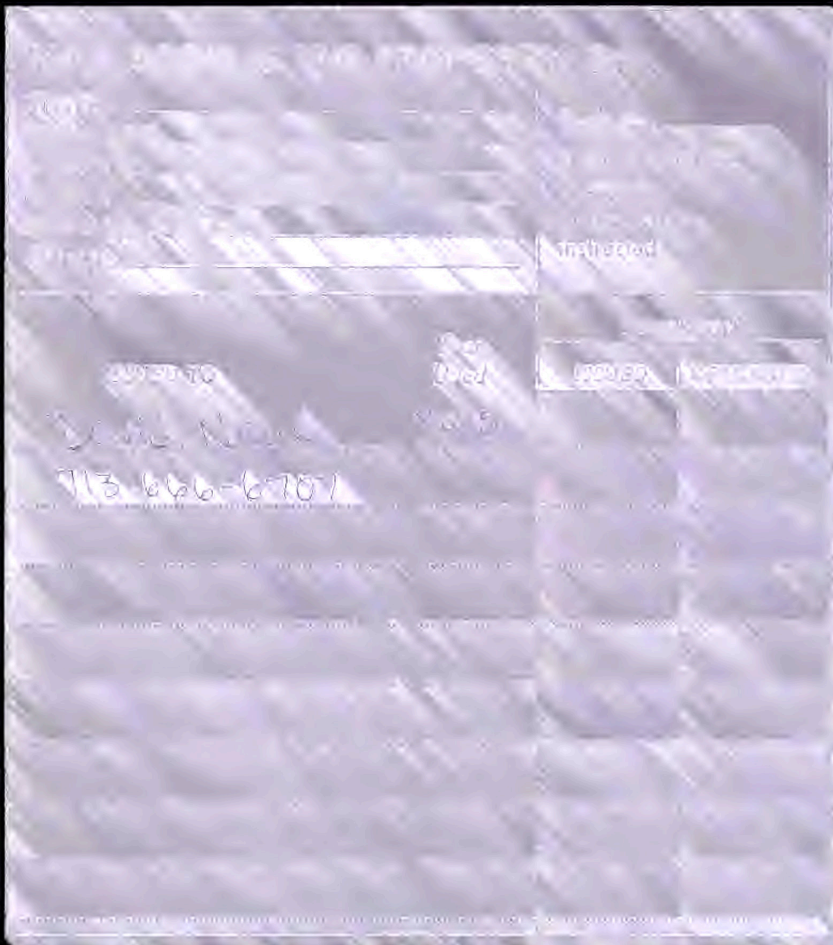

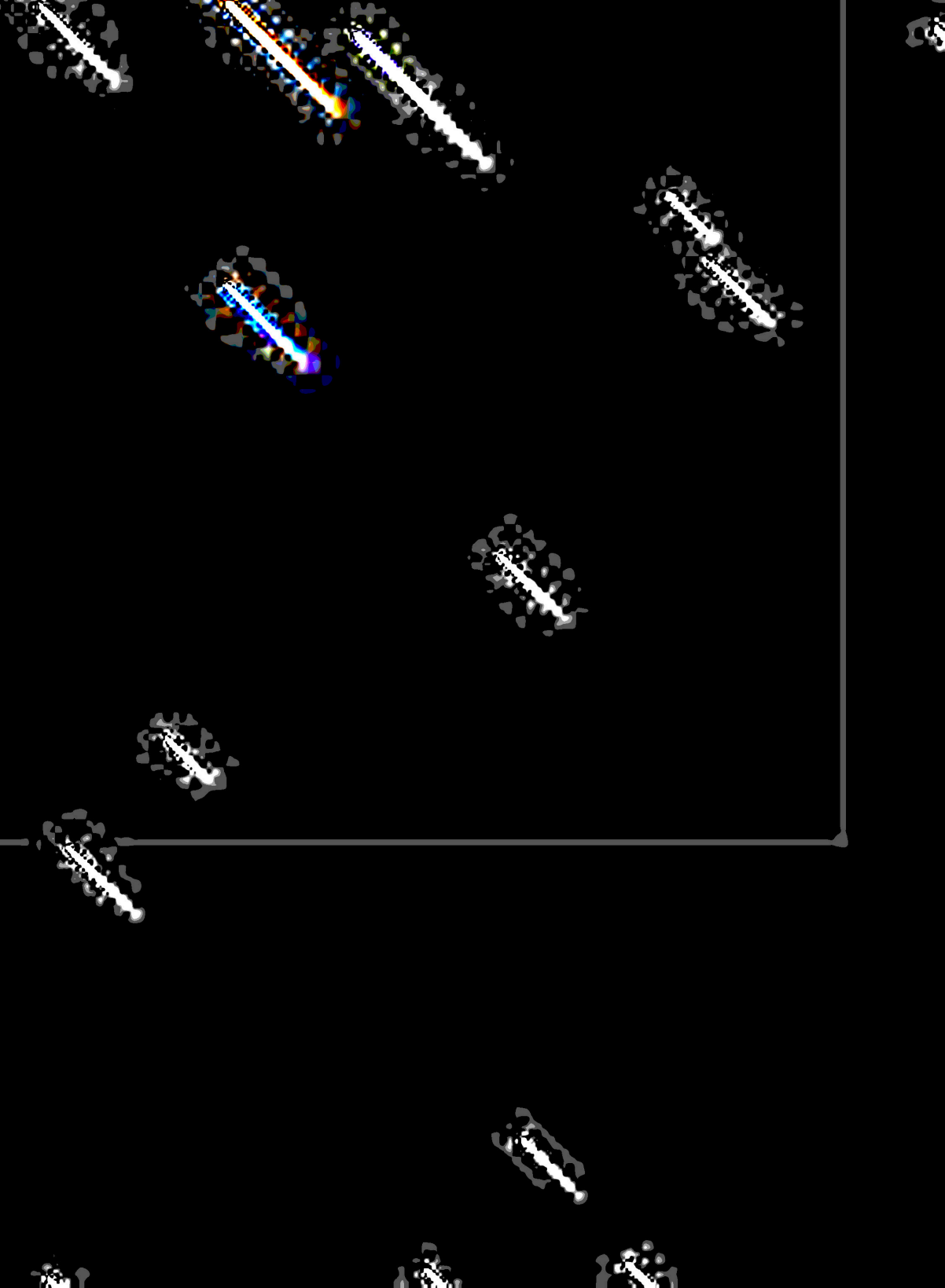

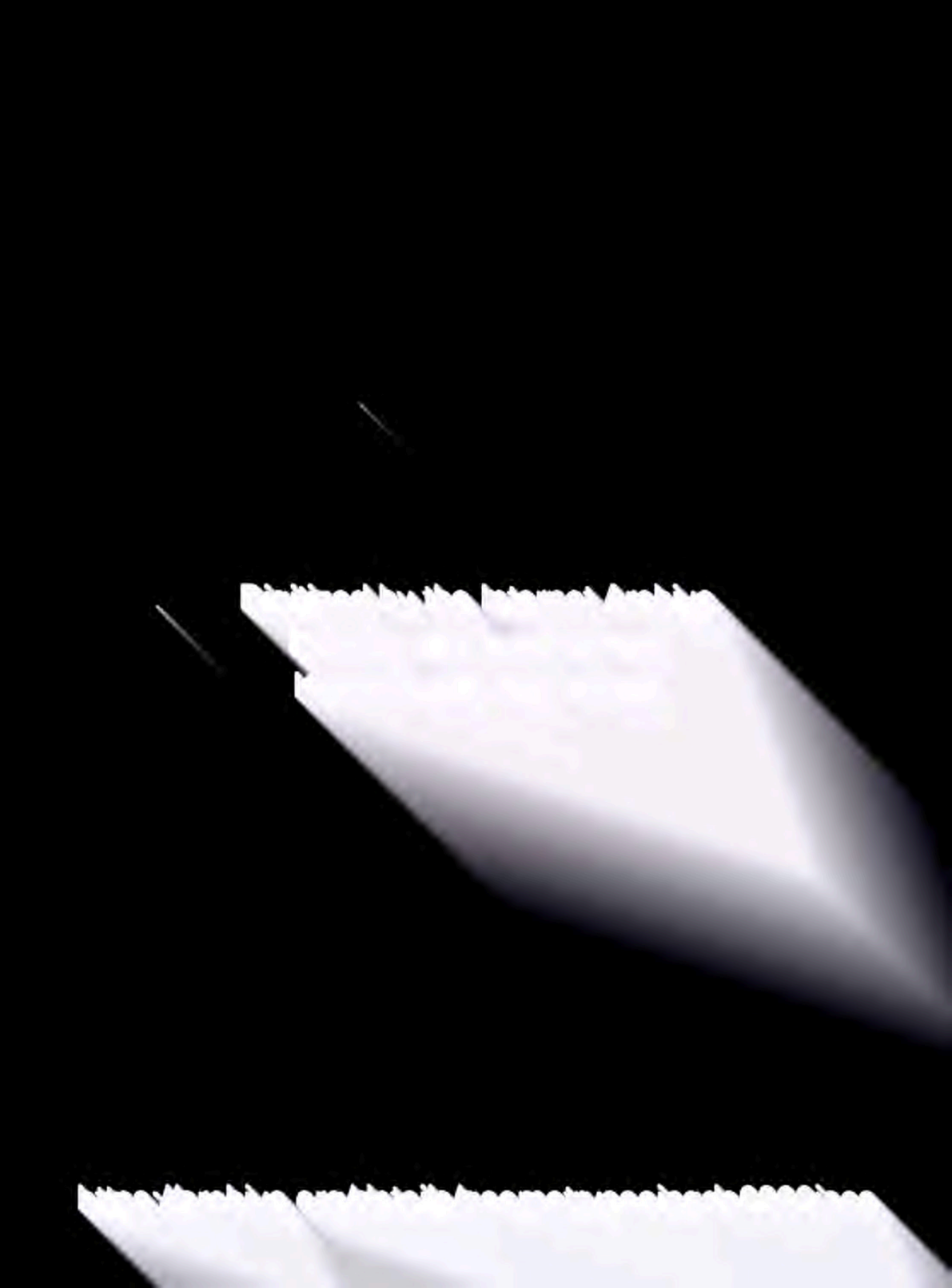

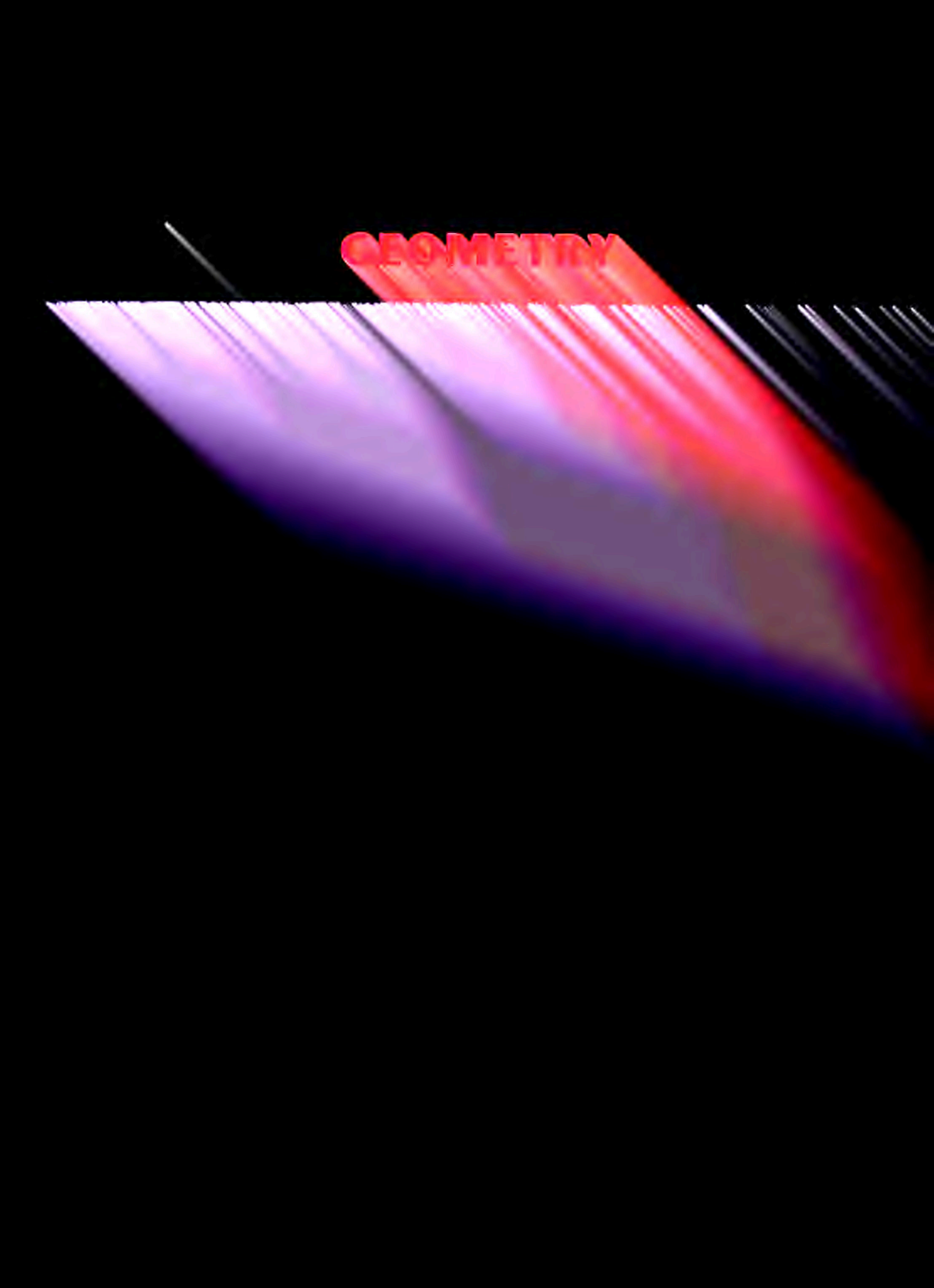
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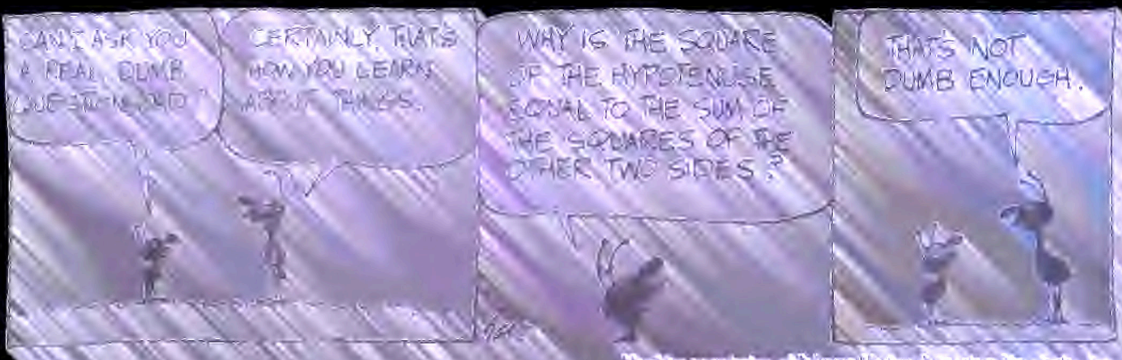
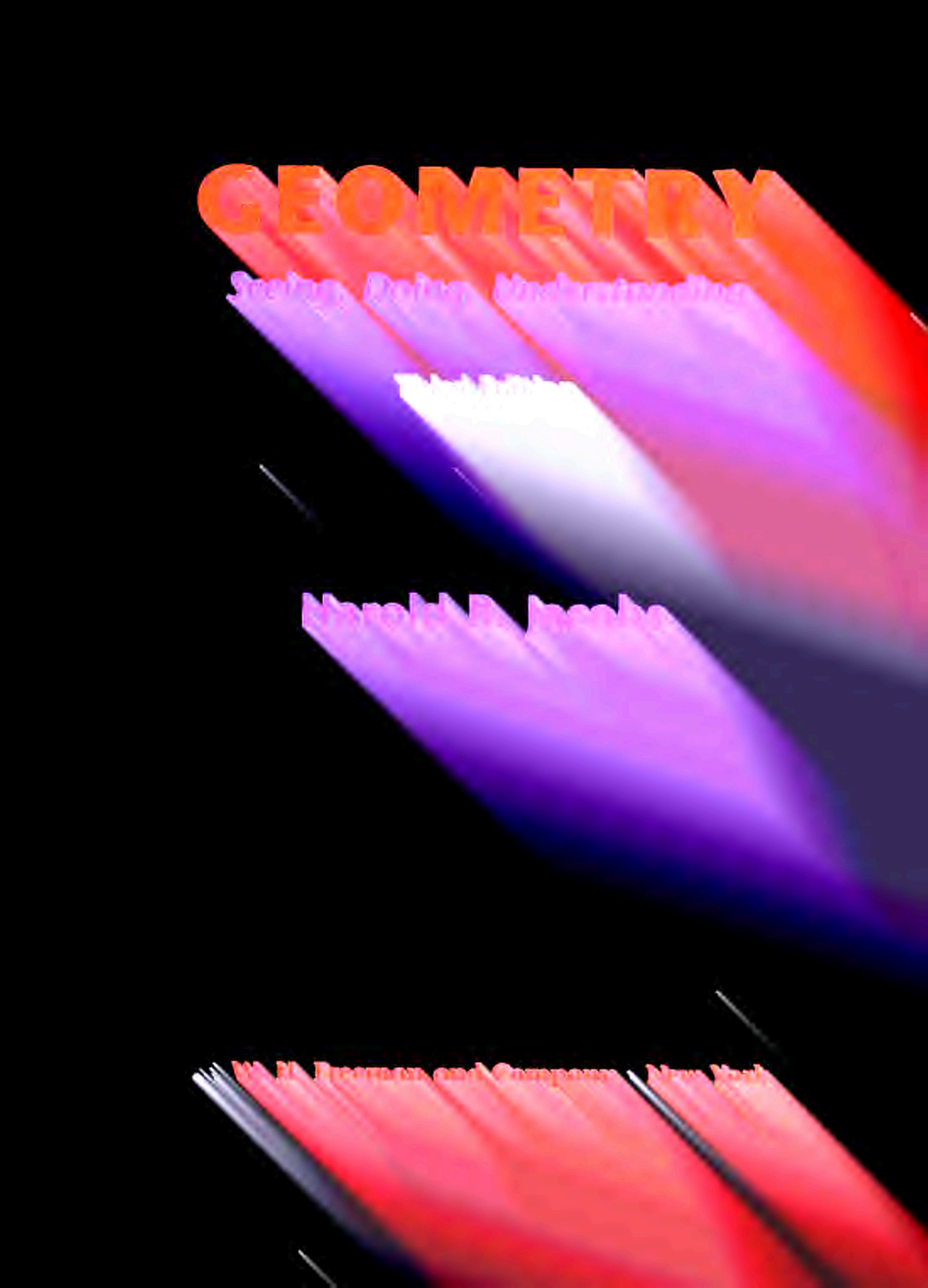

CAN I ASK YOU A REAL DUMB QUESTION?
CERTAINLY. THAT'S HOW YOU LEARN ABOUT THINGS.
WHY IS THE SQUARE OF THE HYPOTENUSE EQUAL TO THE SUM OF THE SQUARES OF THE OTHER TWO SIDES?
THAT'S NOT DUMB ENOUGH.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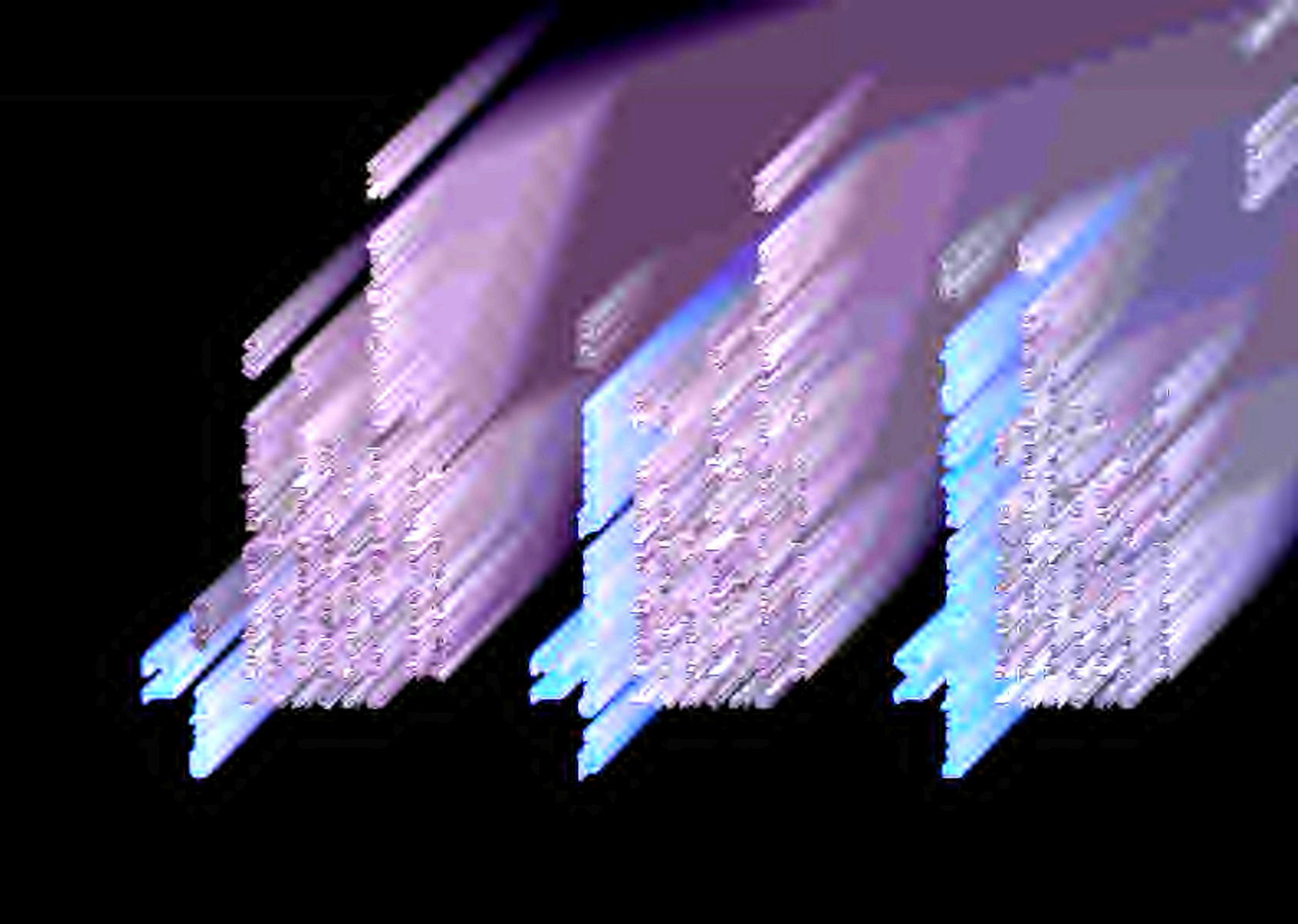

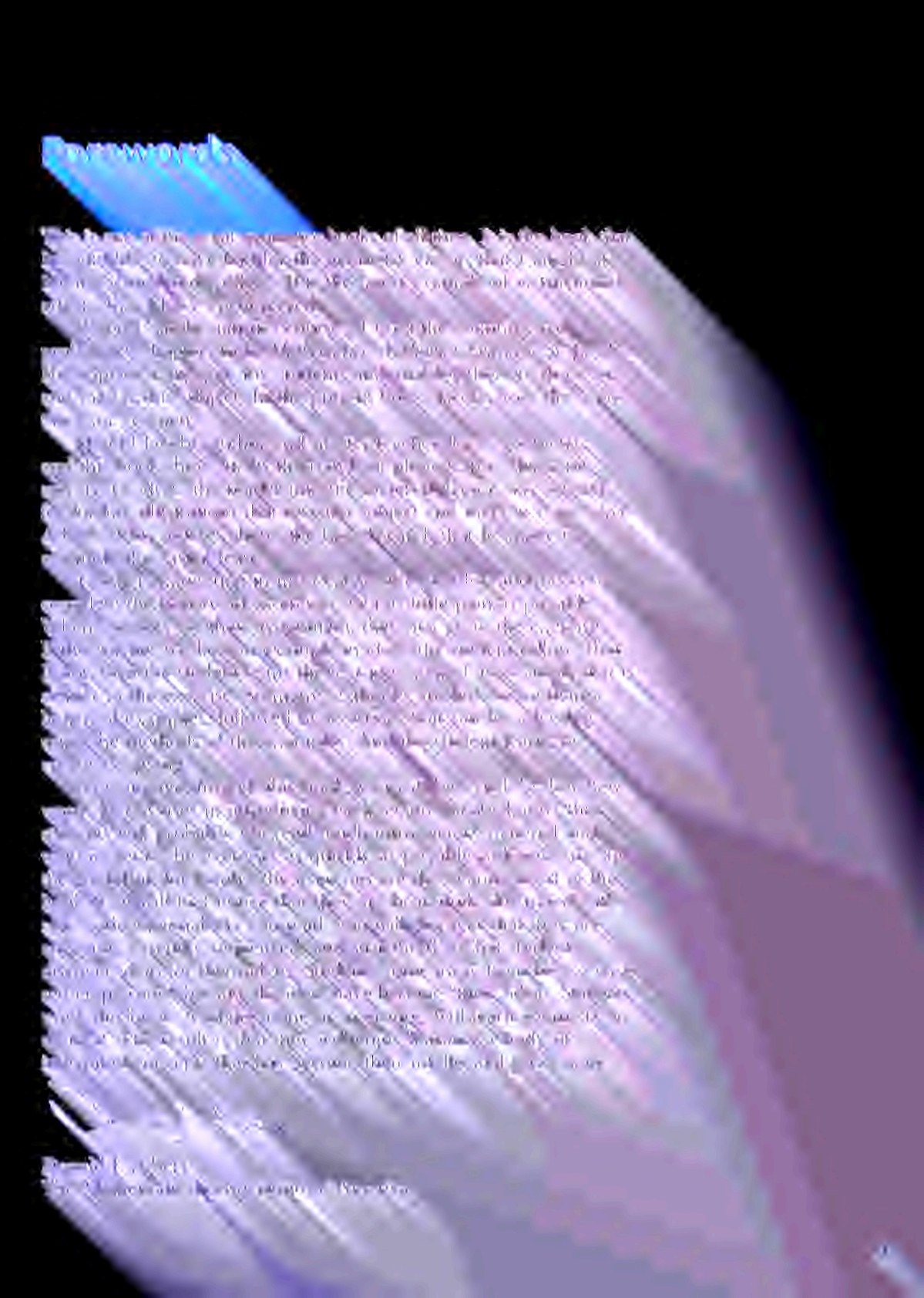

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Andrew M. Gleason

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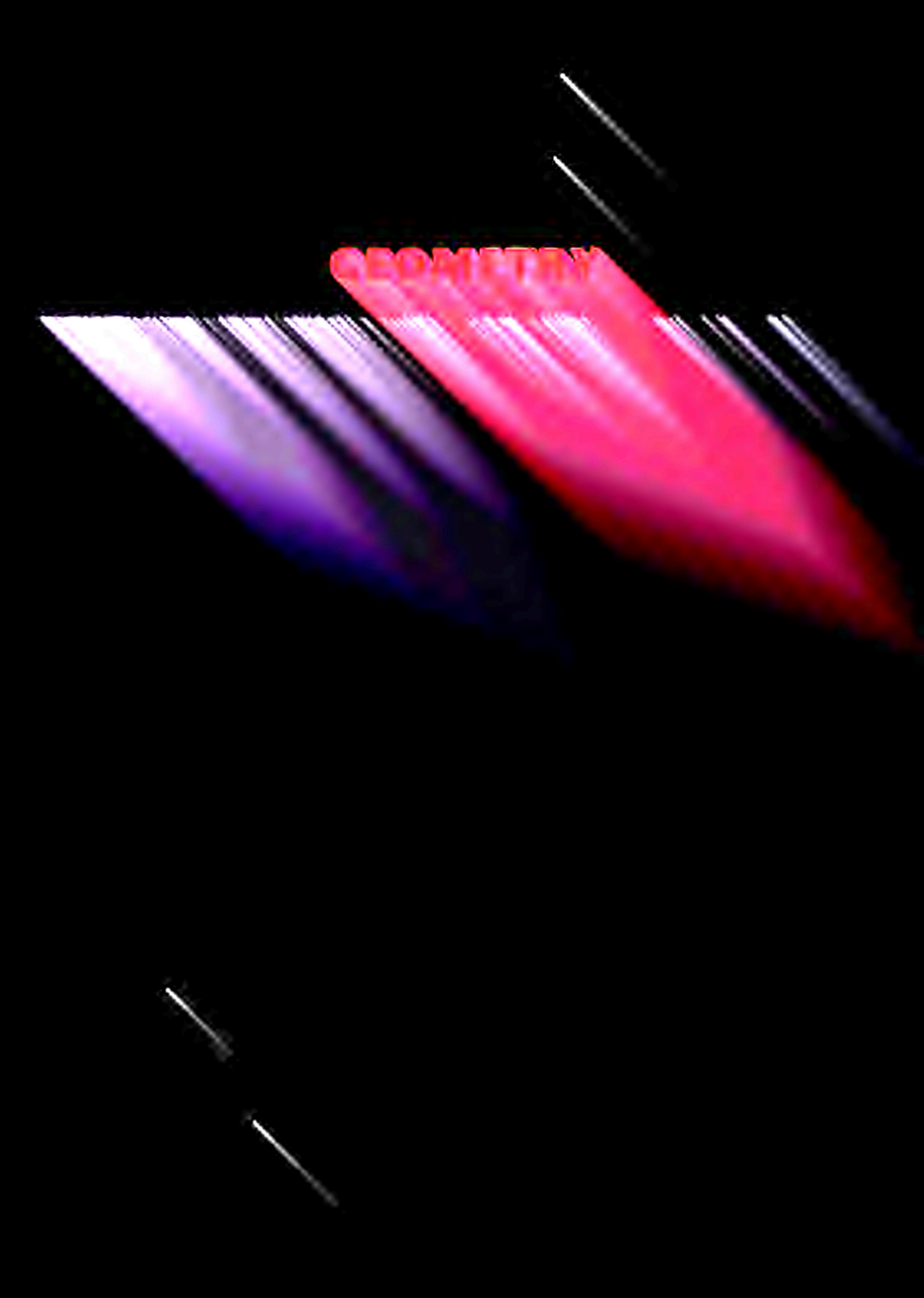
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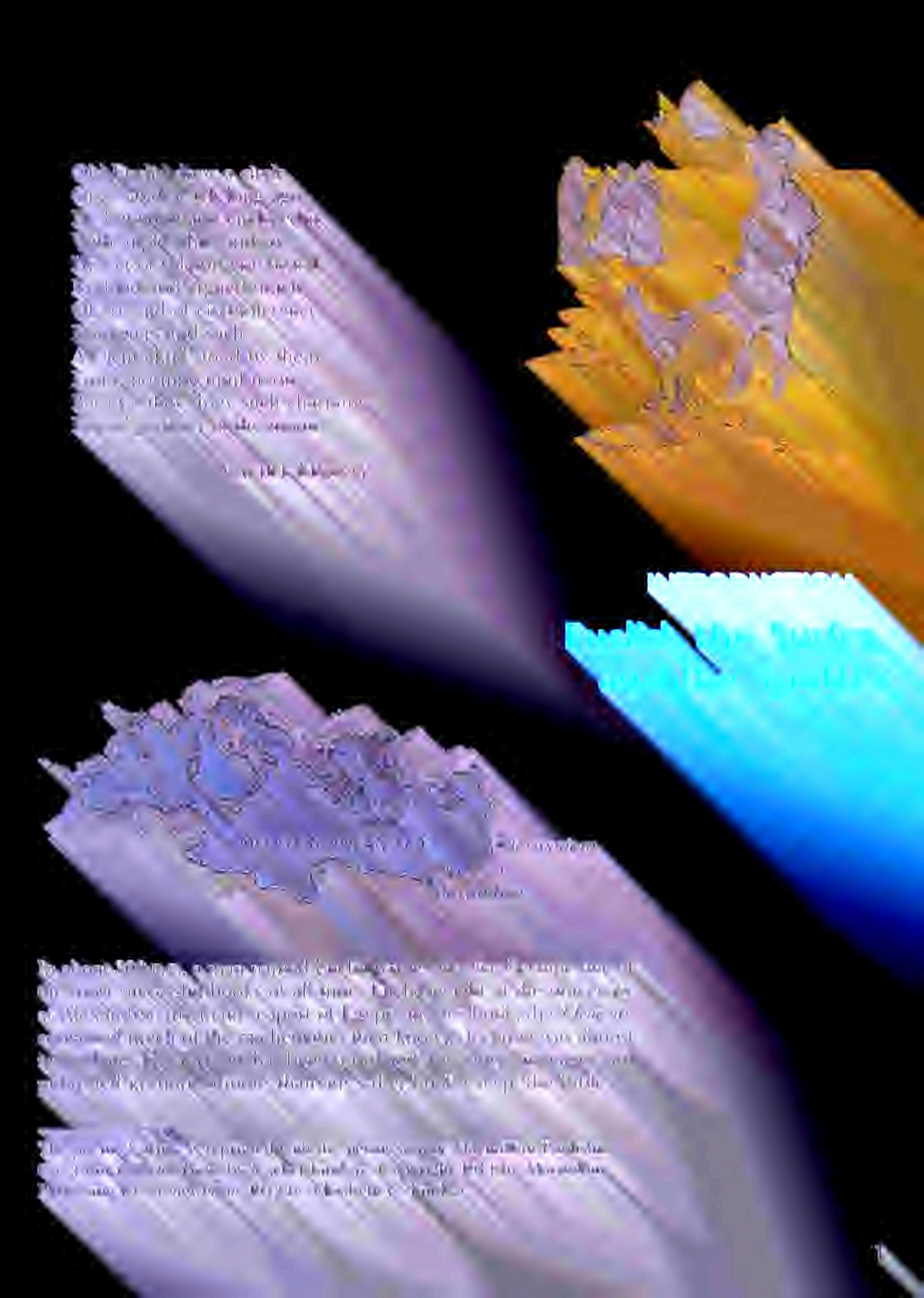

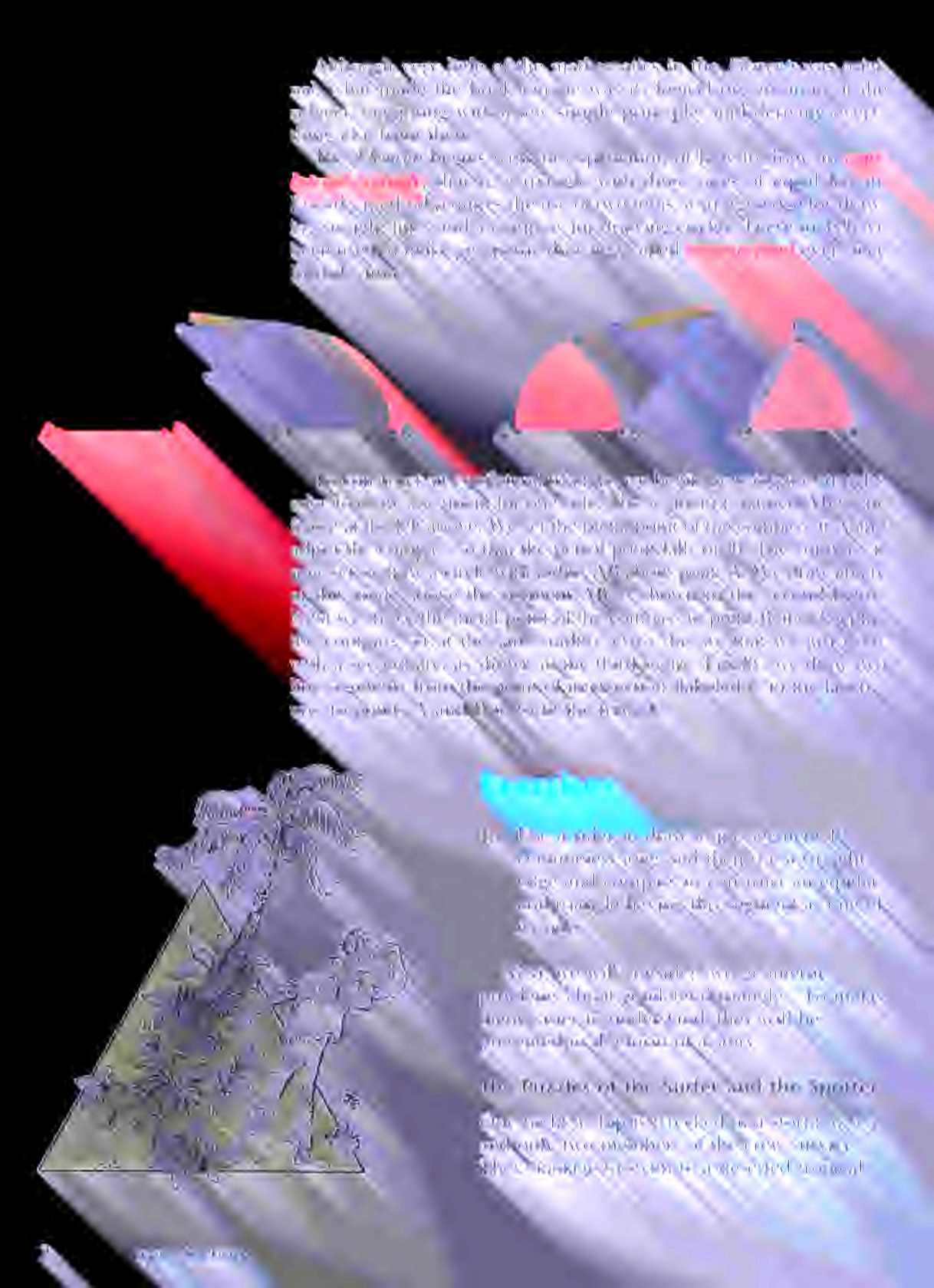

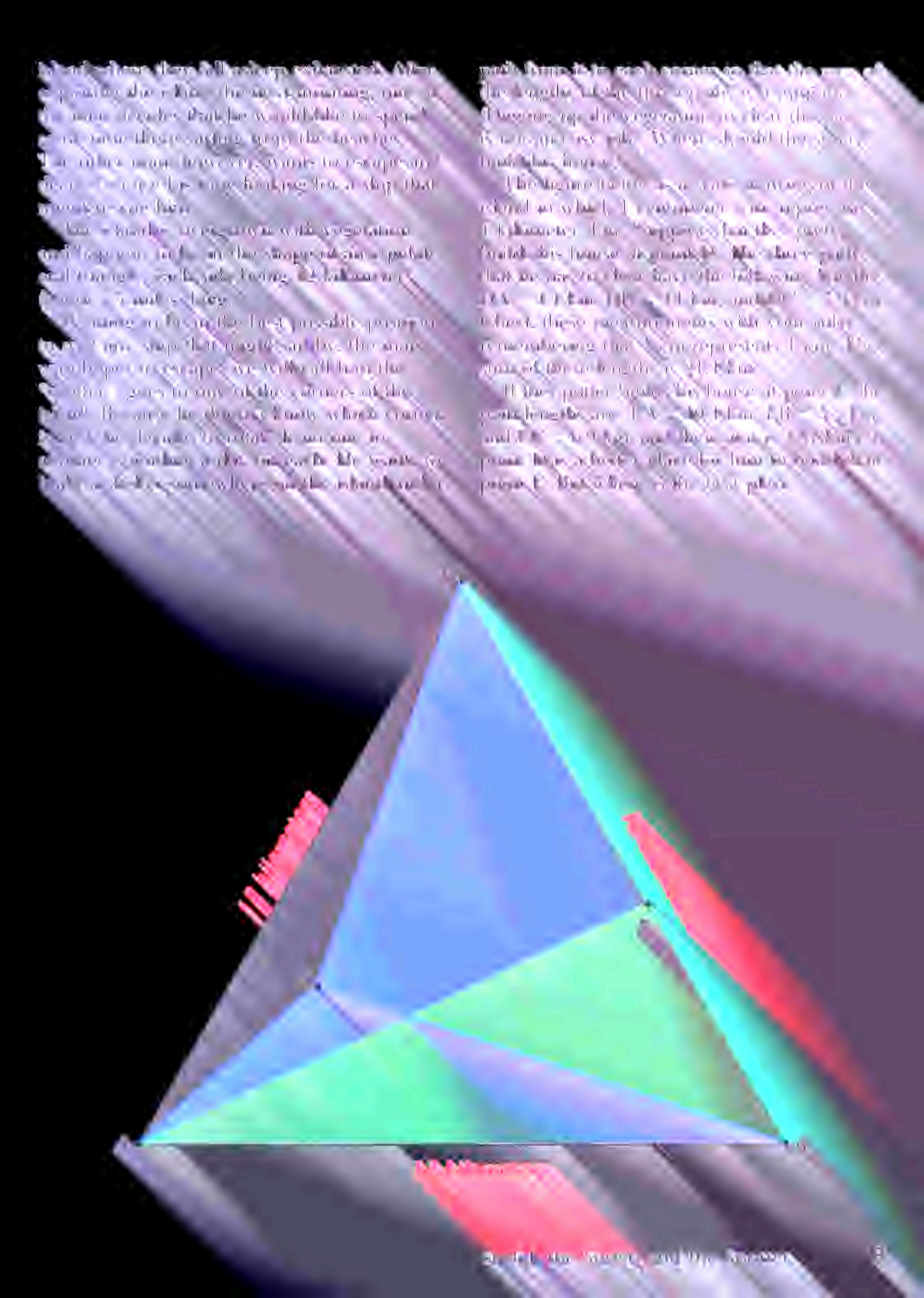

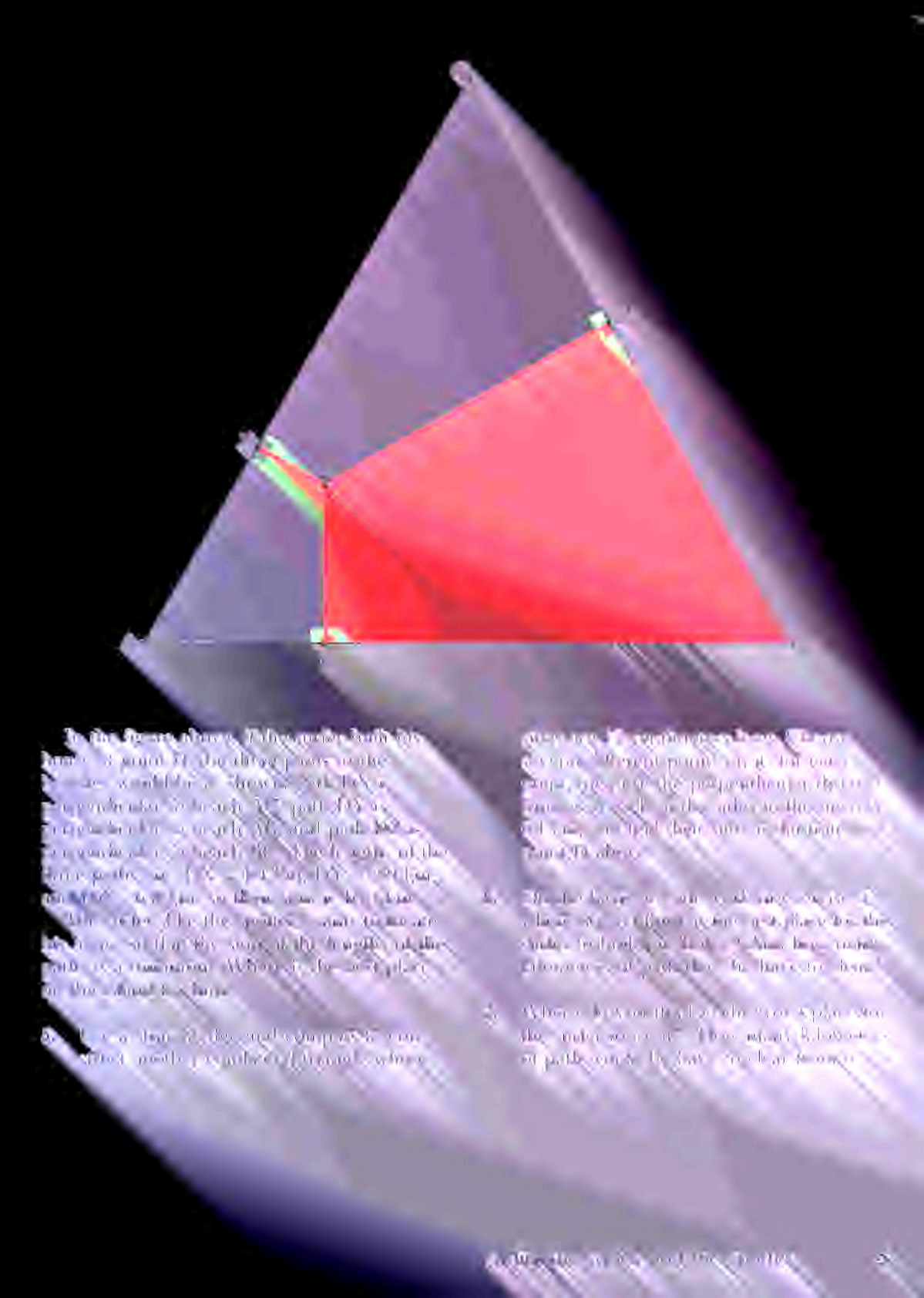





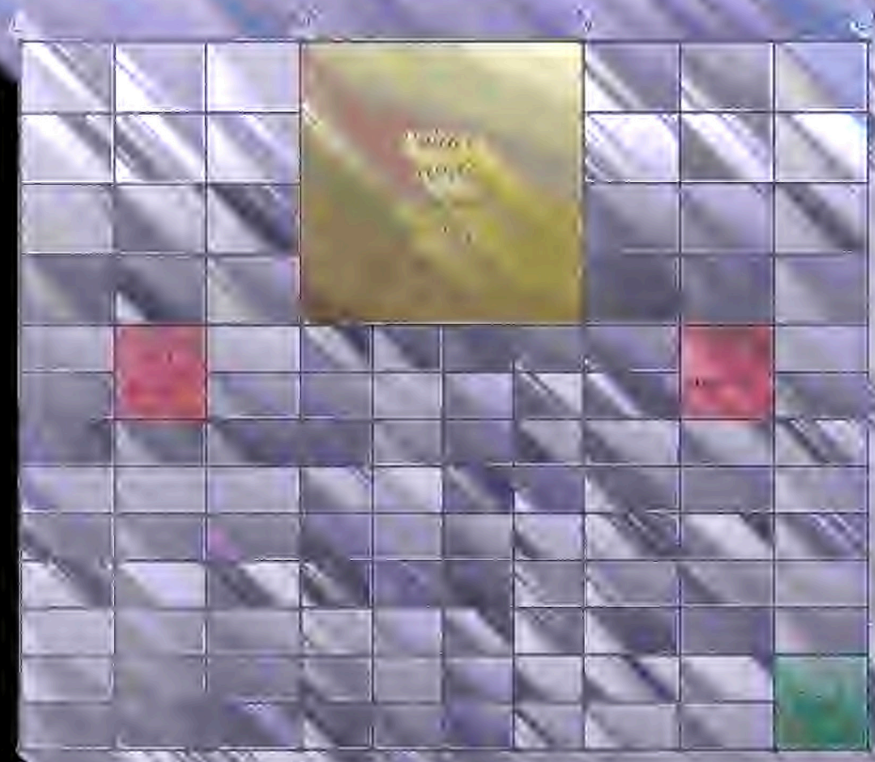

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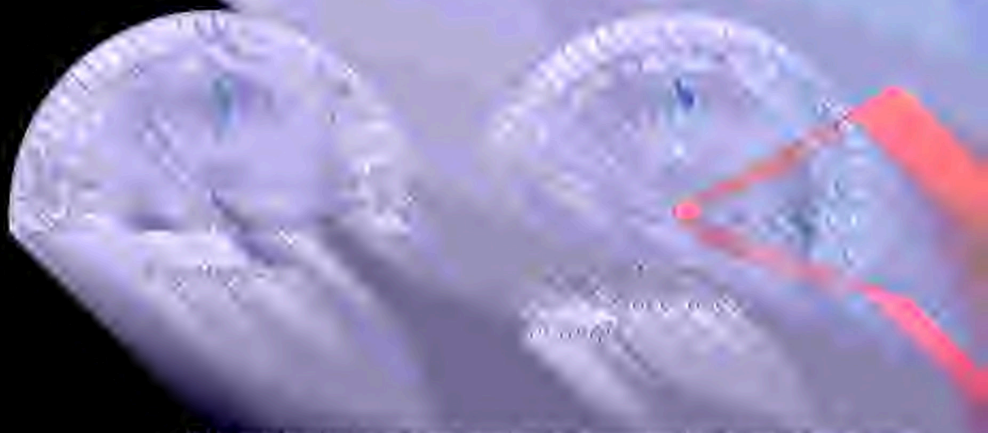
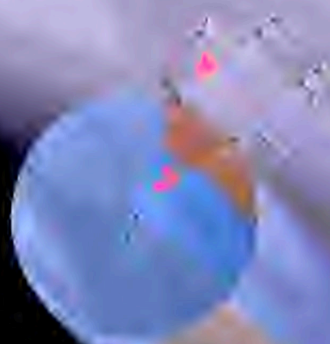






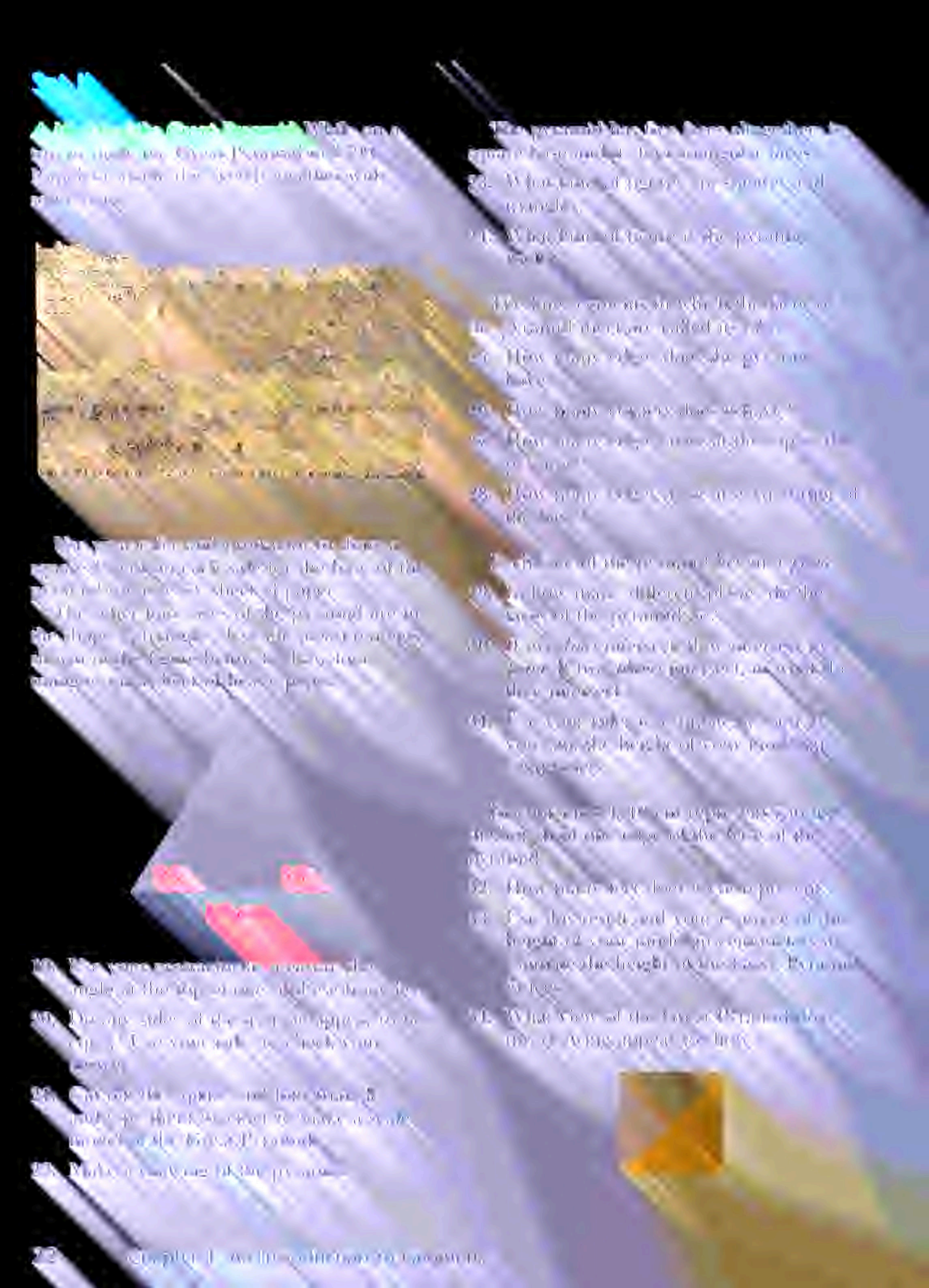


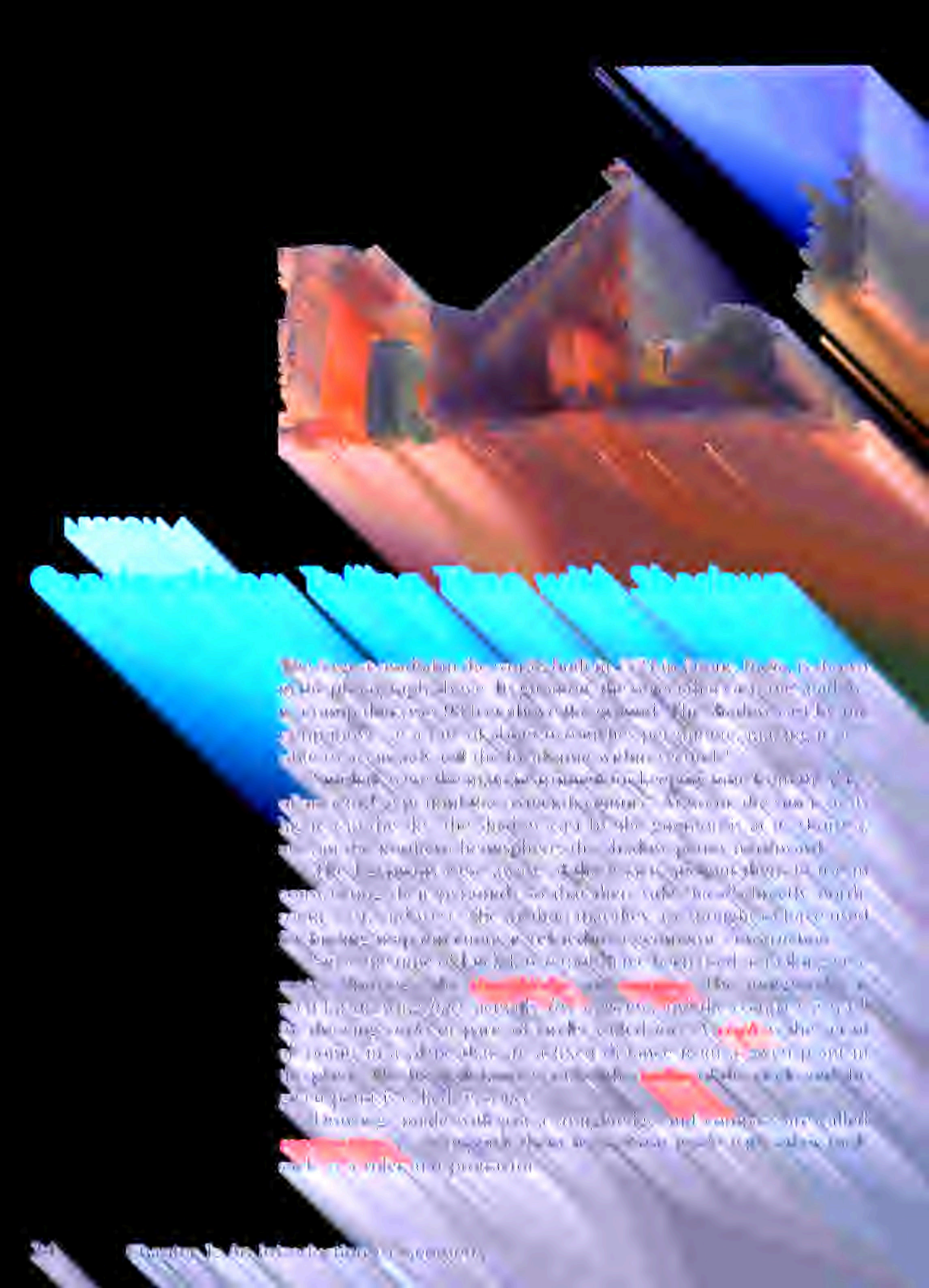












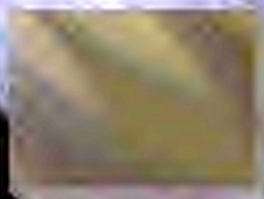



SUN-DIAL!



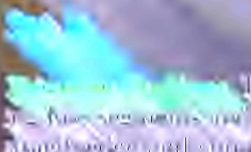






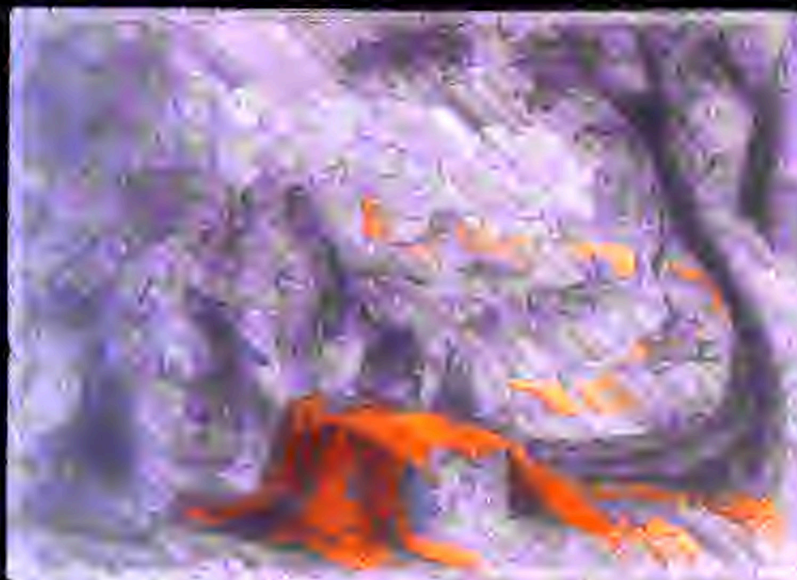






















Consolidated Statements









Horse by Any Other Name Is Still a Horse?

It's All in the Name

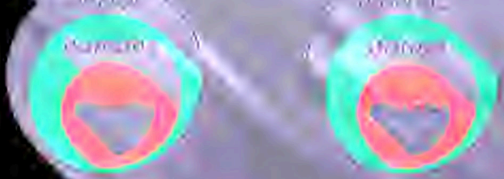


ACCORDING TO A HORSEMAN:

ACCORDING TO THE DICTIONARY:

Definitions

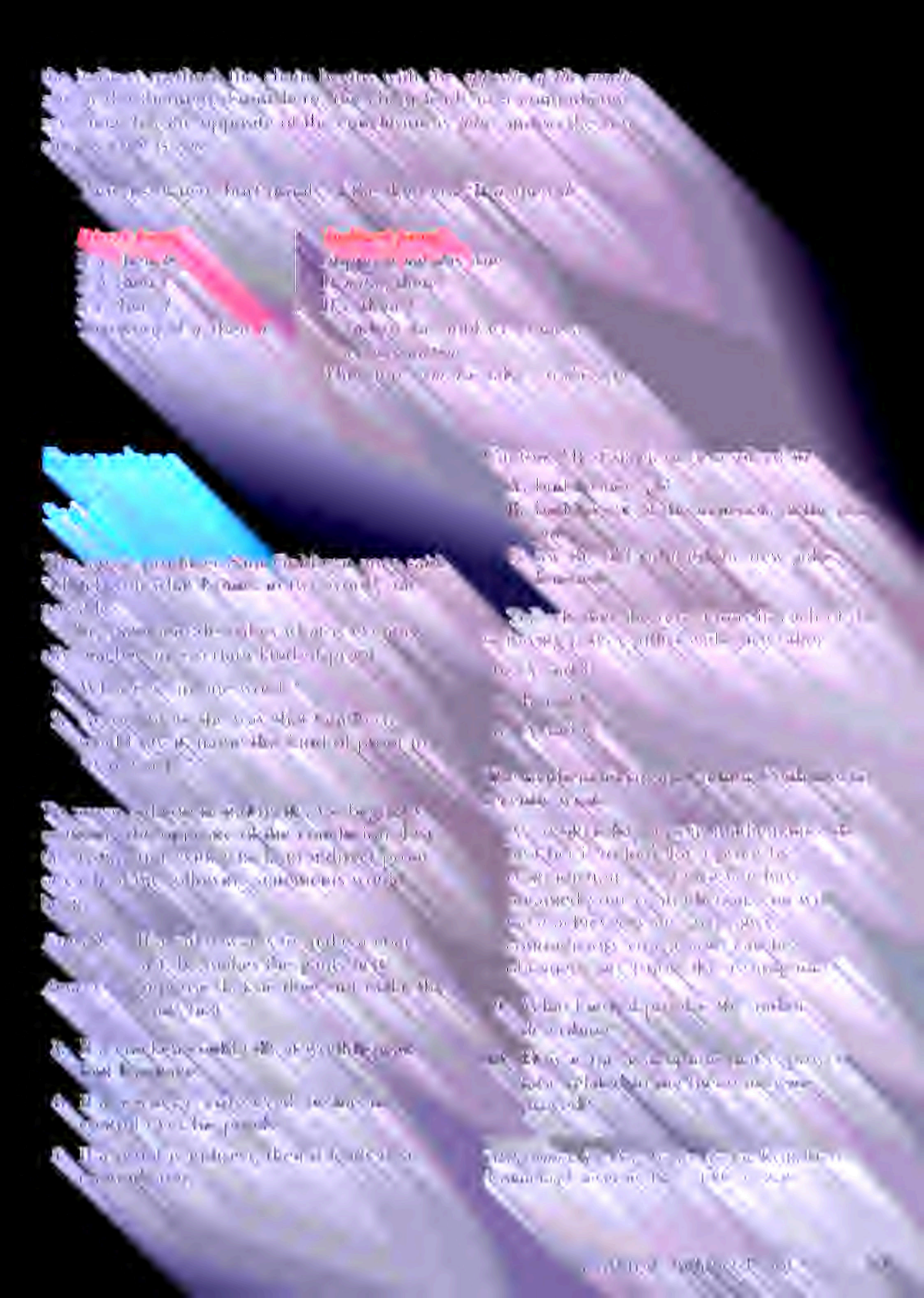
Direct Proof





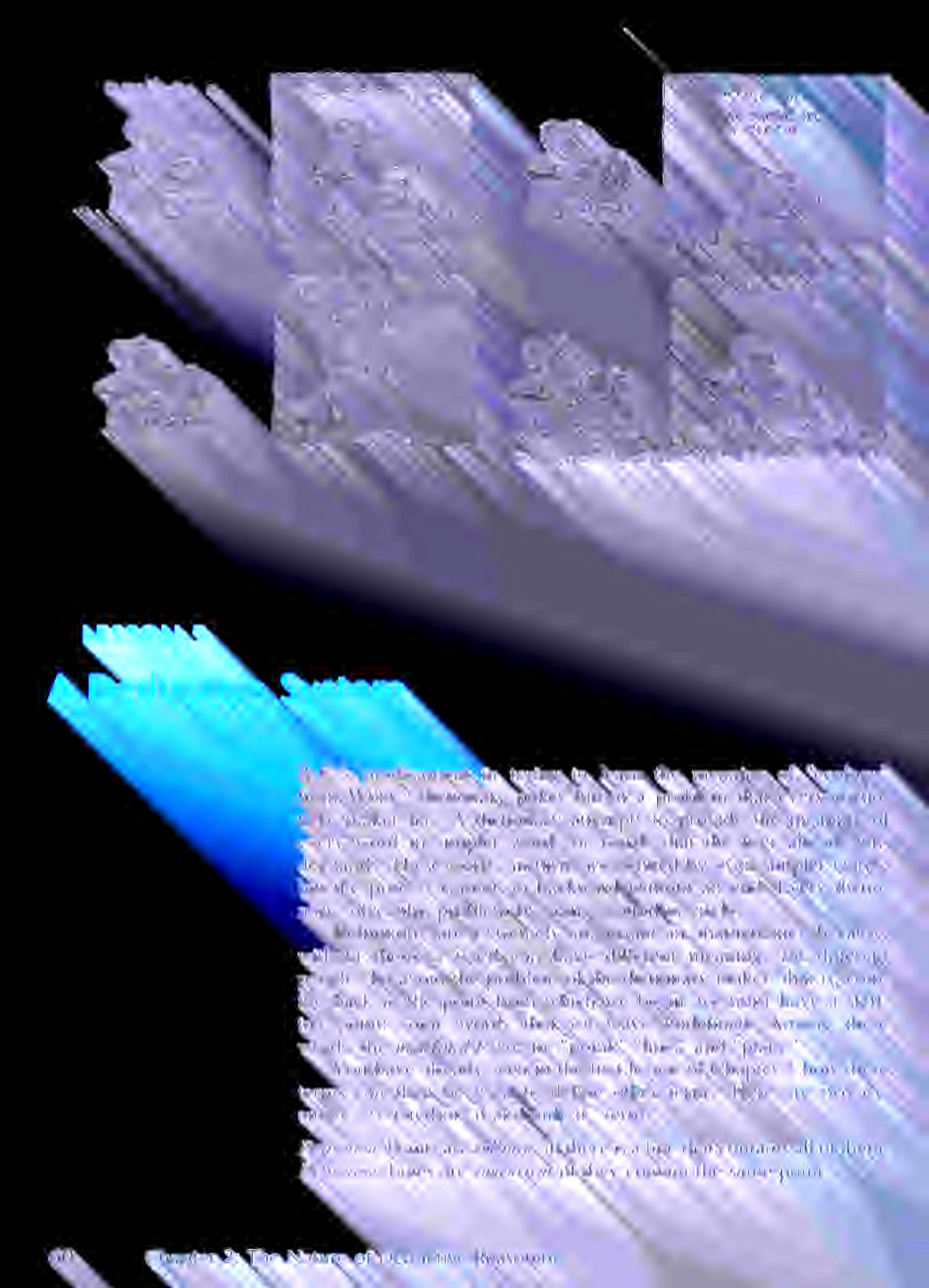




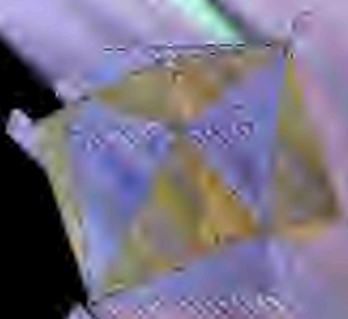




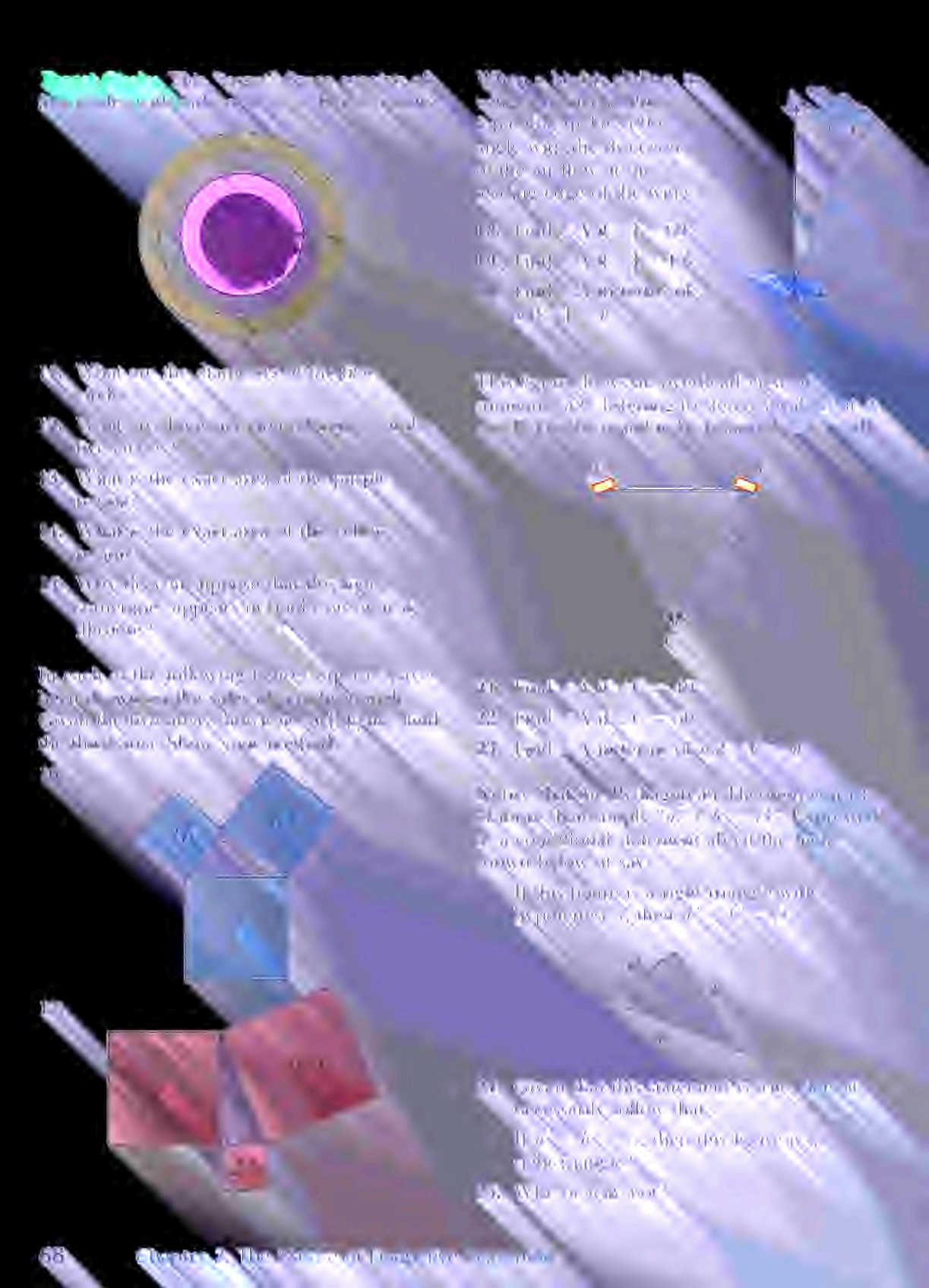








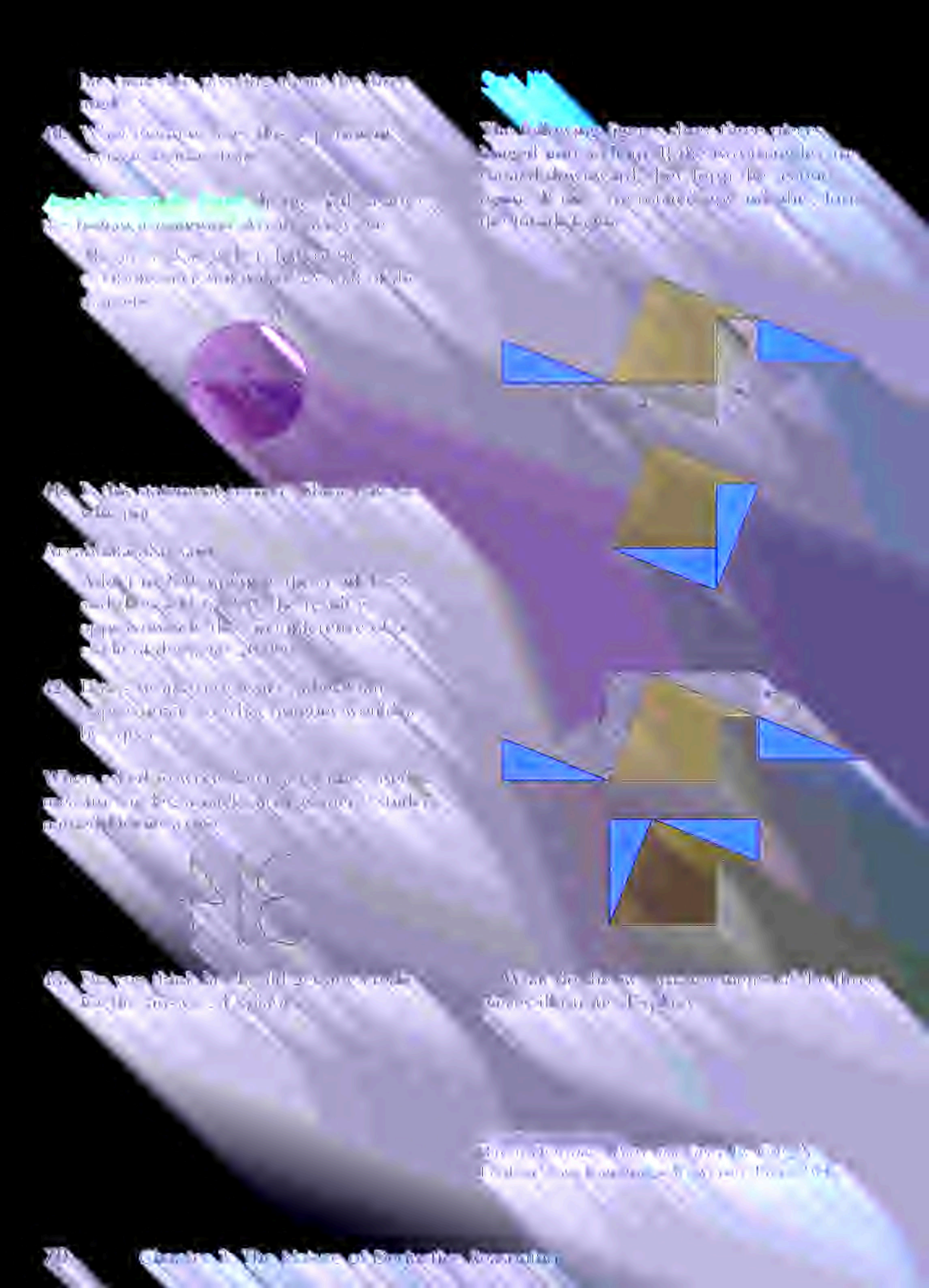












The figure below represents the physical
[illegible] of the Spanish Sub-Continent.



[illegible]

[illegible]

[illegible]



Study the figure. This figure shows a [illegible]

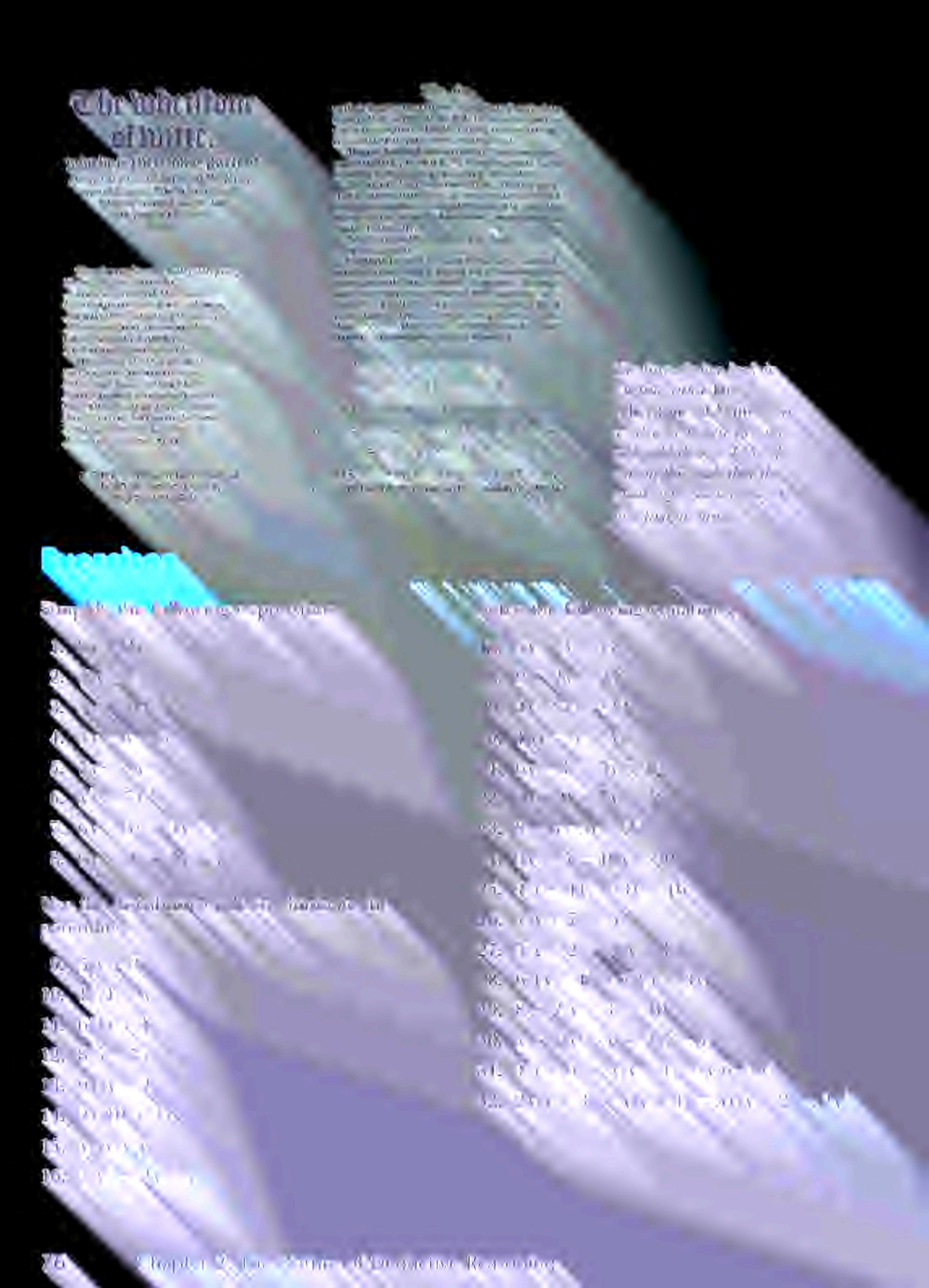


[illegible]

[illegible]

[illegible]







Exercises

Set 1

Name the property of equality that is used in the following statements.

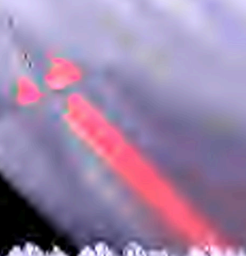
1. If $a = b$ and $c = d$, then $a + c = b + d$.
2. If $a = b$ and $c = d$, then $a + c = b + d$ and $a + d = b + c$.
3. If $\frac{a}{b} = \frac{c}{d}$, then $c = \frac{a}{b}$.
4. If $A \cong B \cong C = 180 - \frac{a}{b}$, $A \cong C \cong B$, then $A \cong C = 180 - \frac{a}{b}$.
5. If $A \cong C = 180$, then $A \cong C = 90$.

In this figure the perimeter of the greater sign is equal to the perimeter of the red square.



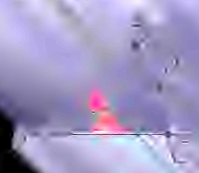
6. Write an equation to show this equality.
7. What is $a = c = d$, $a = f = e^{-1}$?

This figure shows two line-segments where several angles, three of which are numbered.



8. If $\angle 1 \cong \angle 2 \cong \angle 3 \cong \angle 4$, then $\angle 1 \cong \angle 2$. Why?
9. If $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 3$, then $\angle 1 \cong \angle 3$. Why?
10. If $\angle 1 \cong \angle 2$ and $\angle 3 \cong \angle 4$, then $\angle 1 \cong \angle 2 \cong \angle 3 \cong \angle 4$. Why?

This figure shows how we bisected an angle by using a triangle and compass. Let's check the algebra to see that it is the [illegible] space.



11. If $\angle ABC = \angle 1 \cong \angle 2$ and $\angle 1 \cong \angle 2$, then $\angle ABC = \angle 1 \cong \angle 2 \cong \angle 3$. Why?
12. If $\angle ABC = \angle 2 \cong \angle 3$, then $\angle 1 \cong \angle 2 \cong \angle 3 \cong \angle ABC$. Why?

The distance property does not allow a division of the [illegible] and [illegible] to [illegible] the number [illegible] of the following [illegible]:

13. $\frac{a}{b} = c$ [illegible]
14. $\frac{a}{b} = c$ [illegible]
15. $\frac{a}{b} = c$ [illegible]
16. $\frac{a}{b} = c$ [illegible]
17. What is [illegible] the equation [illegible]

[illegible]

[illegible]

[illegible]

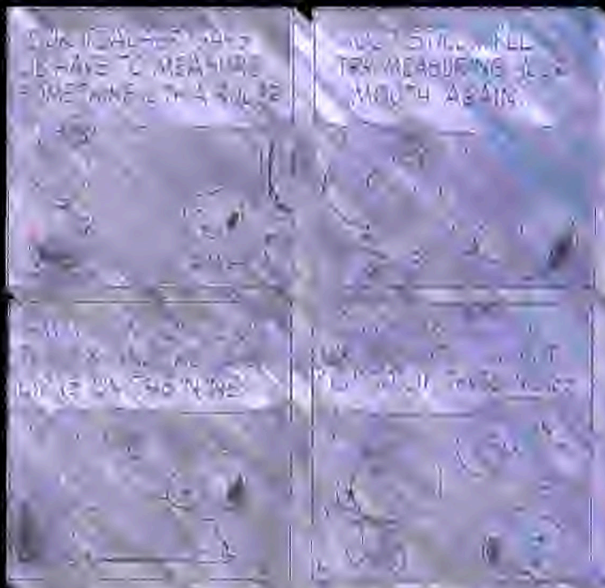
[illegible]

[illegible]









The Ruler and Distance

[illegible]

[illegible]

[illegible]

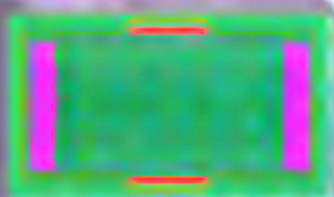
[illegible]

[illegible]

[illegible]





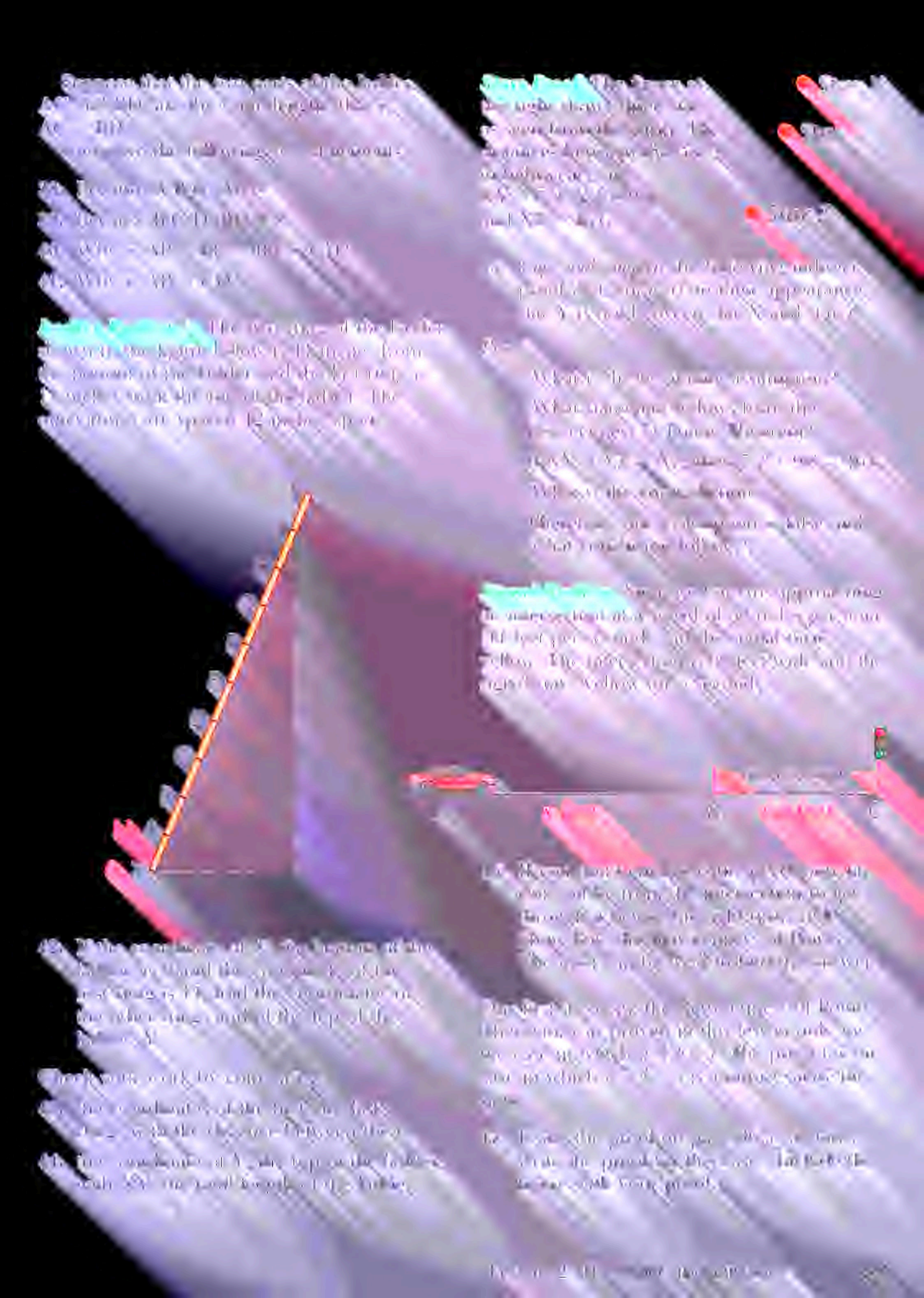


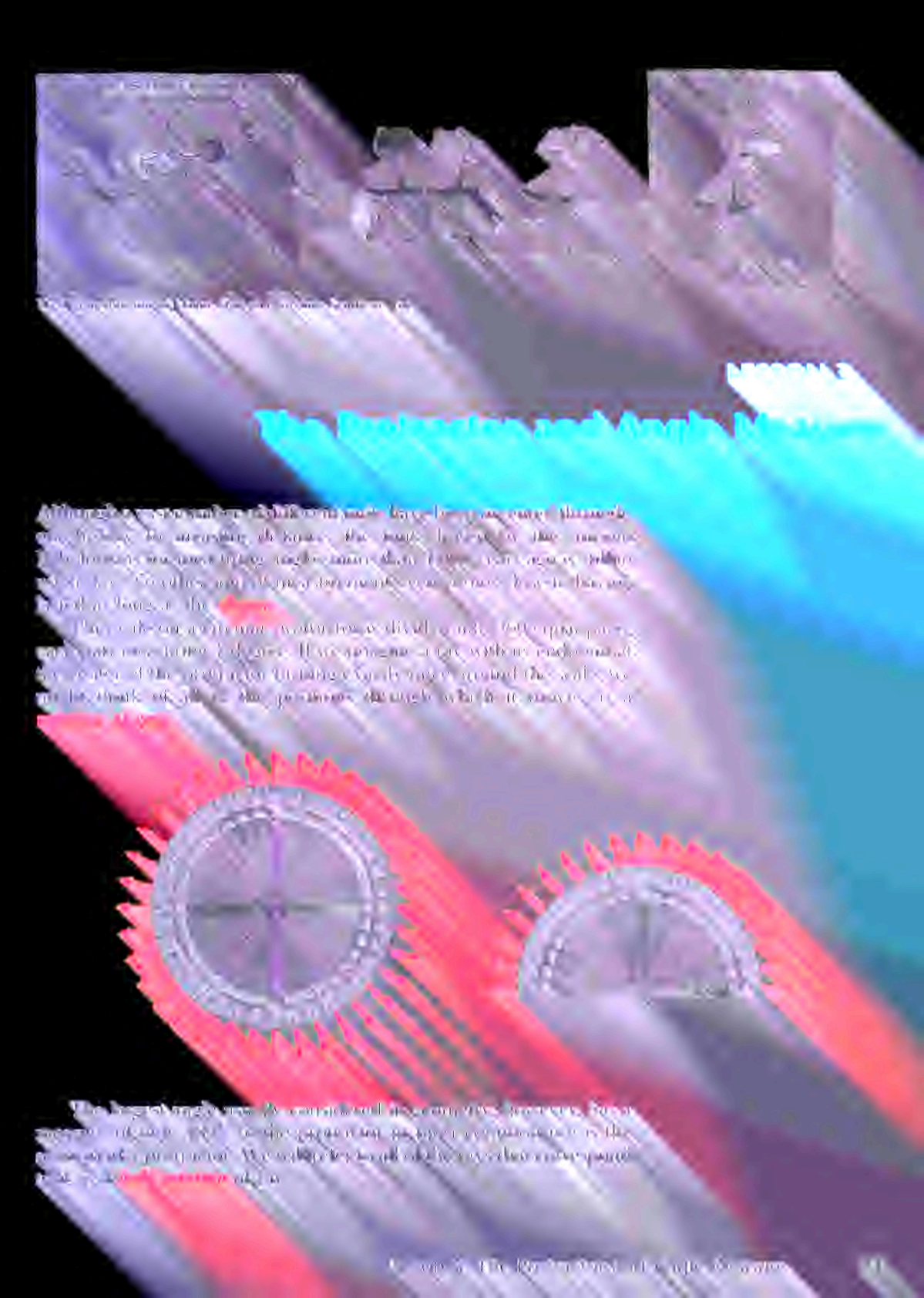
Suppose the base of a [illegible] is [illegible]

[illegible]

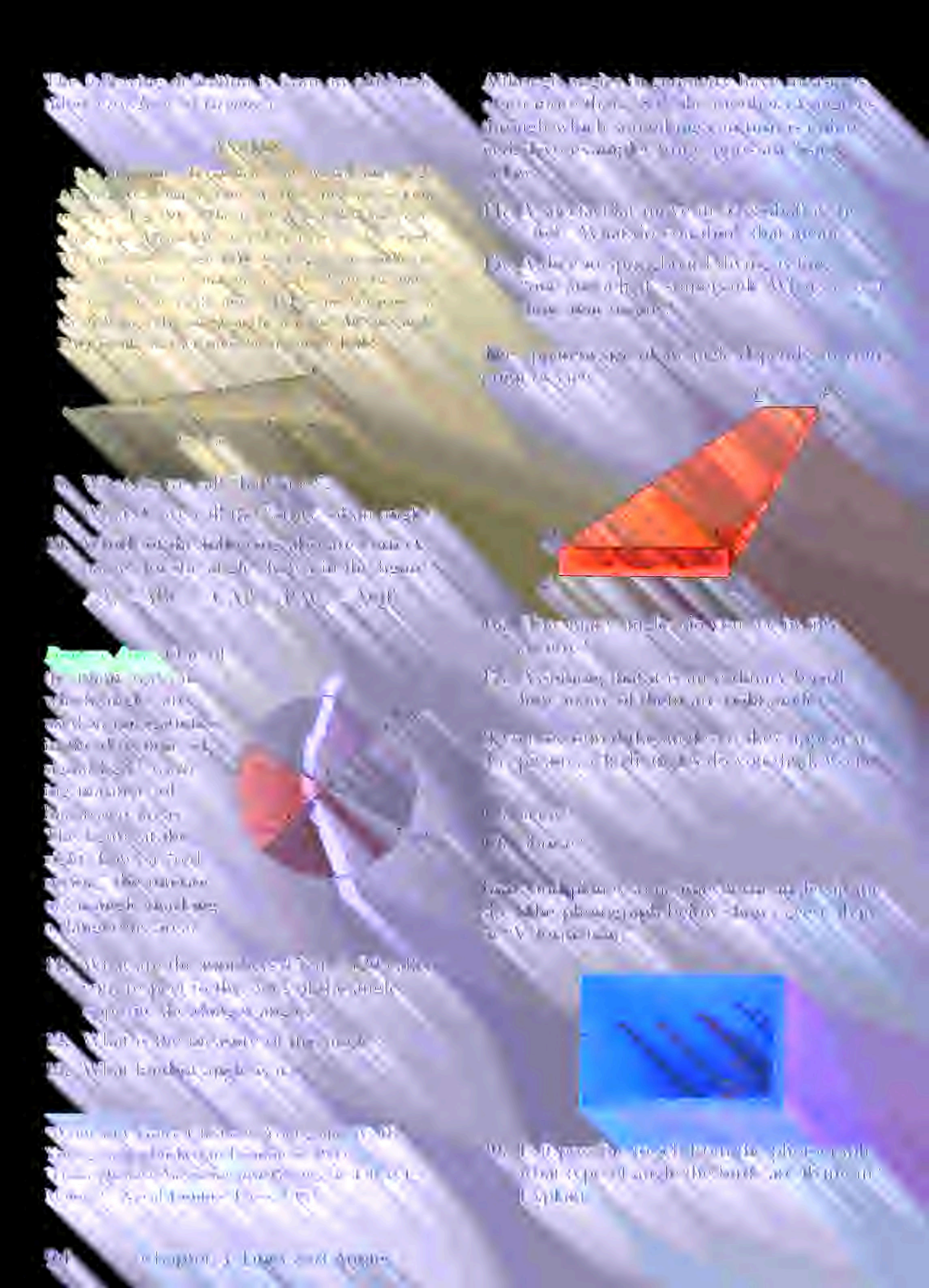
[illegible]

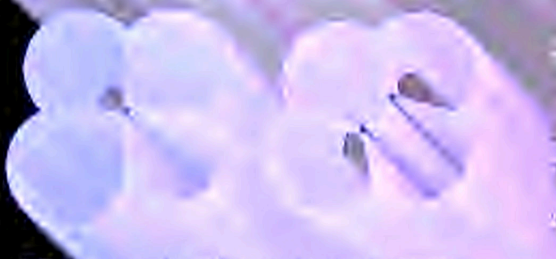
[



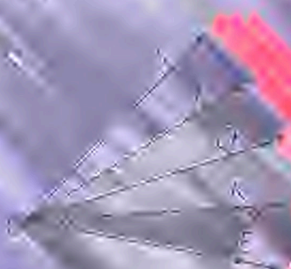








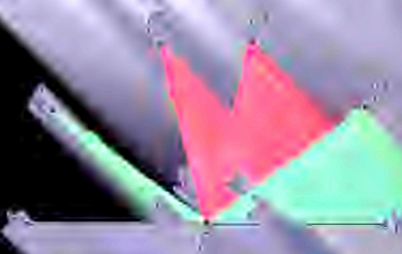


















Example 1 Determine the type of symmetry in the following figures and the number of lines of symmetry.



Solution

(a) The figure has a vertical line of symmetry and a horizontal line of symmetry. Therefore, the figure has two lines of symmetry.

(b) The figure has a vertical line of symmetry. Therefore, the figure has one line of symmetry.

(c) The figure has a vertical line of symmetry and a horizontal line of symmetry. Therefore, the figure has two lines of symmetry.

(d) The figure has a vertical line of symmetry. Therefore, the figure has one line of symmetry.

(e) The figure has a vertical line of symmetry and a horizontal line of symmetry. Therefore, the figure has two lines of symmetry.

Example 2 Determine the order of rotational symmetry of the following figures.



Solution

(a) The figure has rotational symmetry of order 4.

(b) The figure has rotational symmetry of order 2.

(c) The figure has rotational symmetry of order 1.

(d) The figure has rotational symmetry of order 3.

(e) The figure has rotational symmetry of order 2.

Example 3 Determine the number of lines of symmetry and the order of rotational symmetry of the following figures.

(a) Square

(b) Rectangle

(c) Rhombus

(d) Parallelogram

(e) Regular hexagon

Solution

(a) The square has 4 lines of symmetry and rotational symmetry of order 4.

(b) The rectangle has 2 lines of symmetry and rotational symmetry of order 2.

(c) The rhombus has 2 lines of symmetry and rotational symmetry of order 2.

(d) The parallelogram has no lines of symmetry and rotational symmetry of order 2.

(e) The regular hexagon has 6 lines of symmetry and rotational symmetry of order 6.

Example 4 Determine the number of lines of symmetry and the order of rotational symmetry of the following figures.

(a) Isosceles triangle

(b) Equilateral triangle

(c) Scalene triangle

Solution

(a) The isosceles triangle has 1 line of symmetry and rotational symmetry of order 1.

(b) The equilateral triangle has 3 lines of symmetry and rotational symmetry of order 3.

(c) The scalene triangle has no lines of symmetry and rotational symmetry of order 1.

Example 5 Determine the number of lines of symmetry and the order of rotational symmetry of the following figures.

(a) Kite

(b) Regular pentagon

Solution

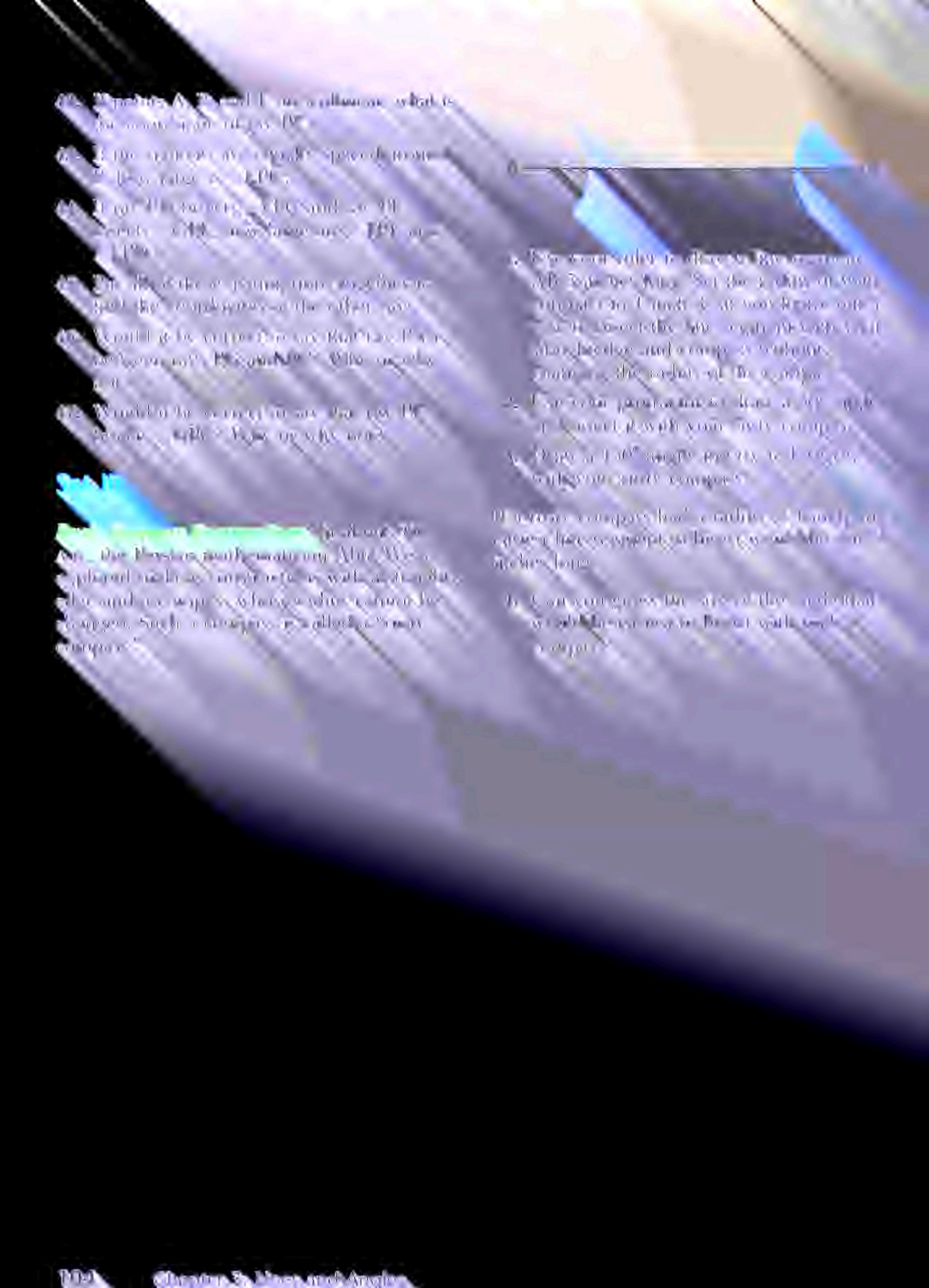
(a) The kite has 1 line of symmetry and rotational symmetry of order 1.

(b) The regular pentagon has 5 lines of symmetry and rotational symmetry of order 5.





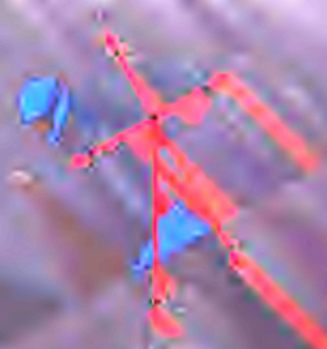


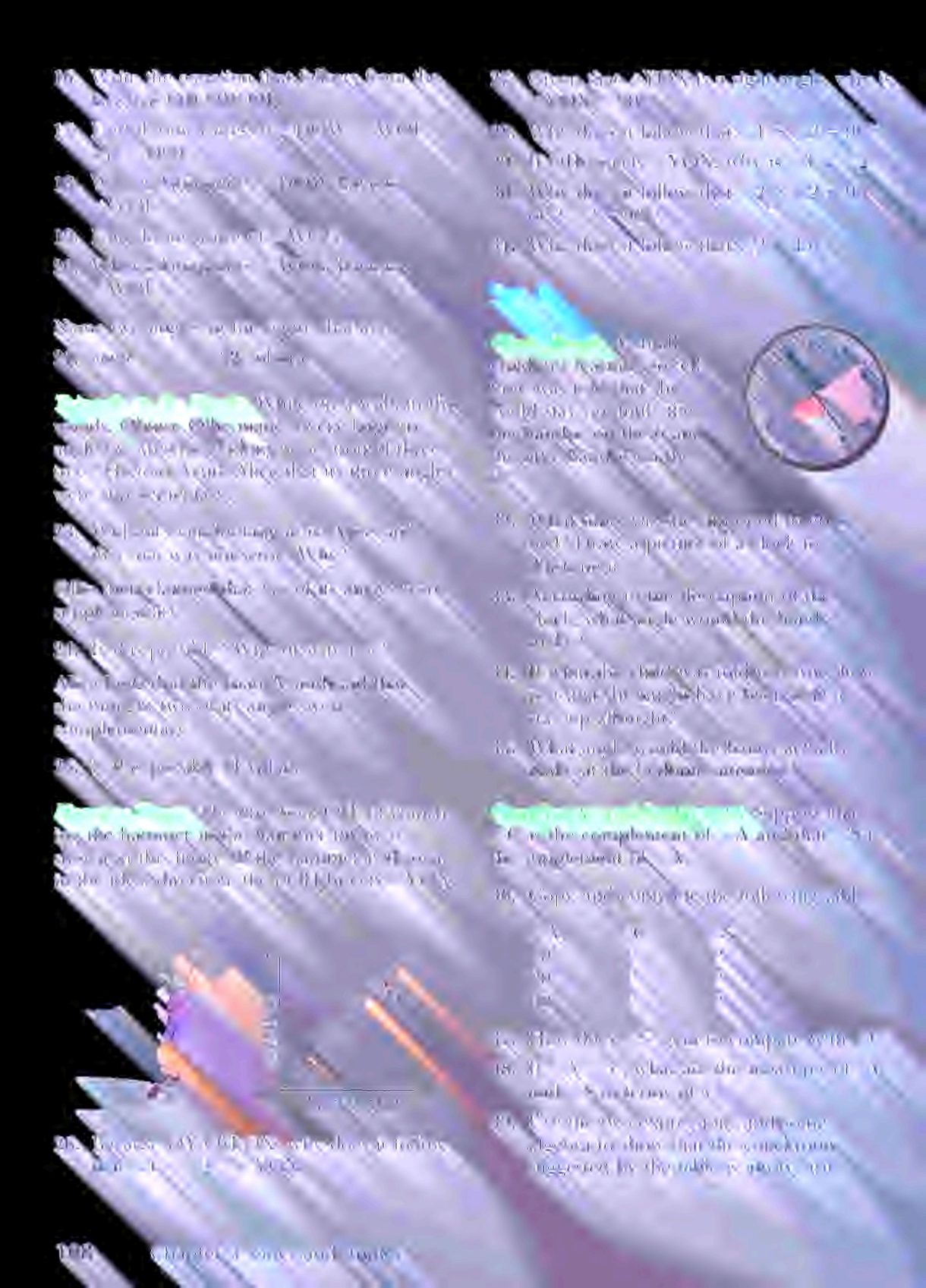




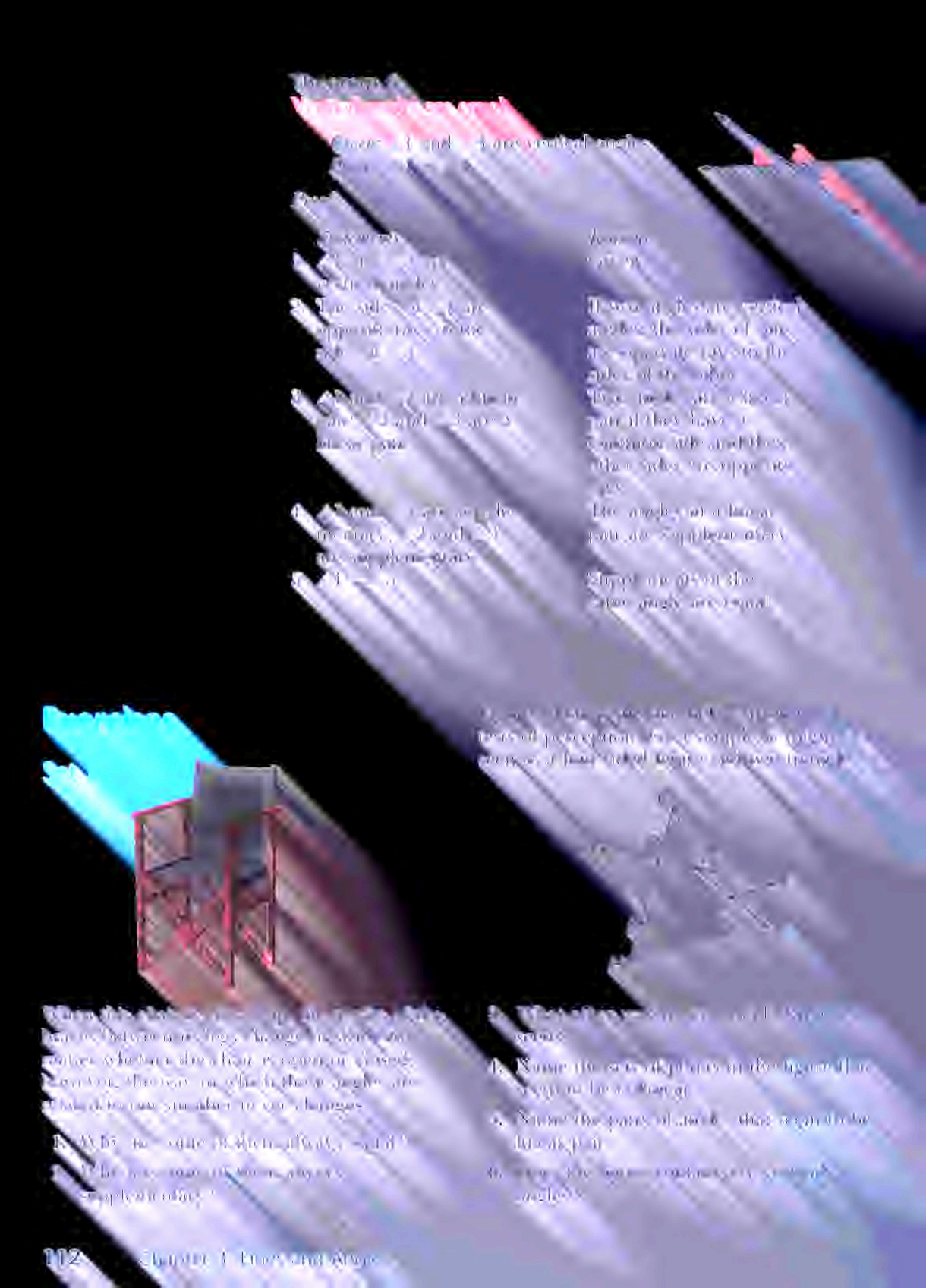
Complementary and Supplementary Angles



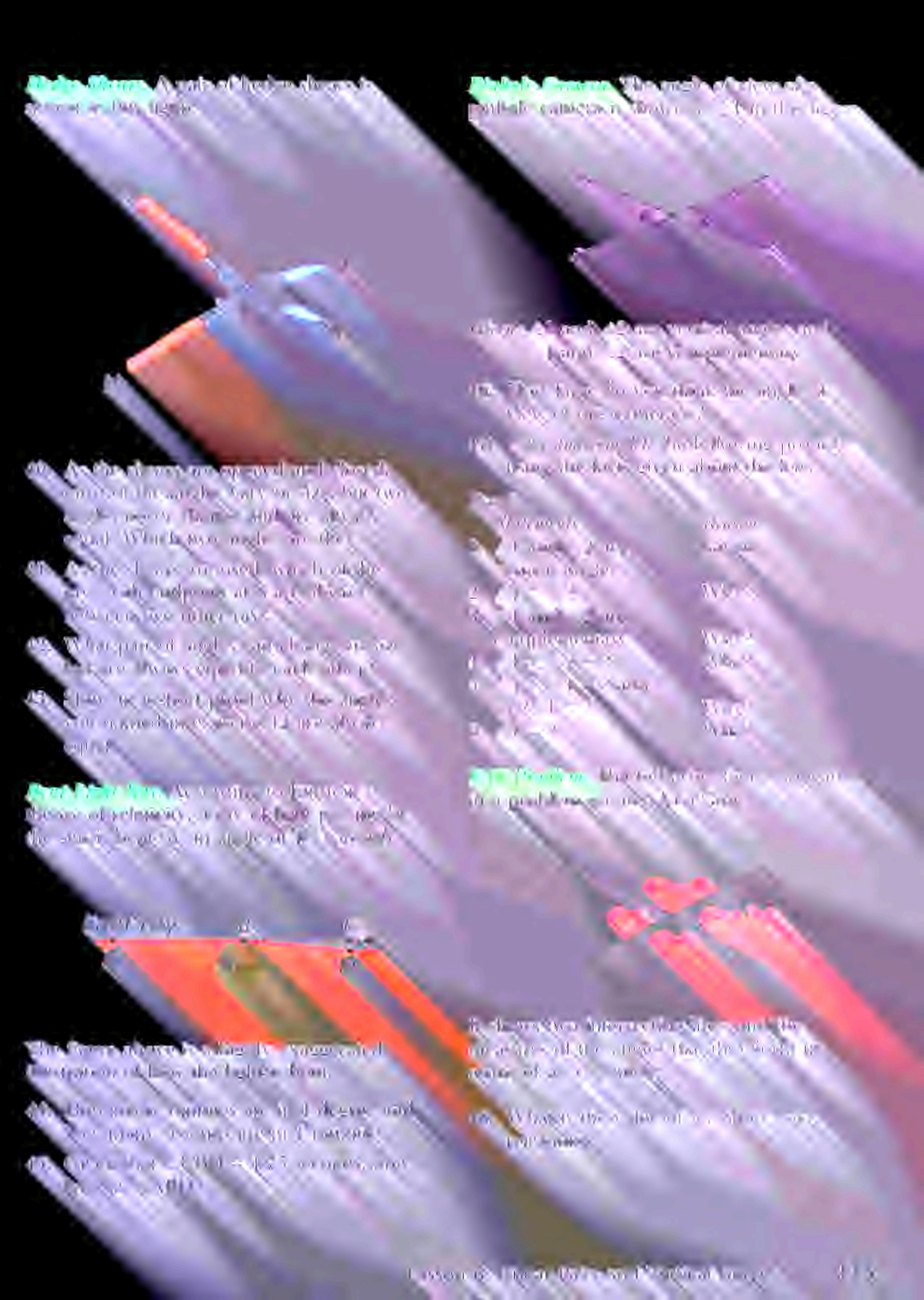












Section VI

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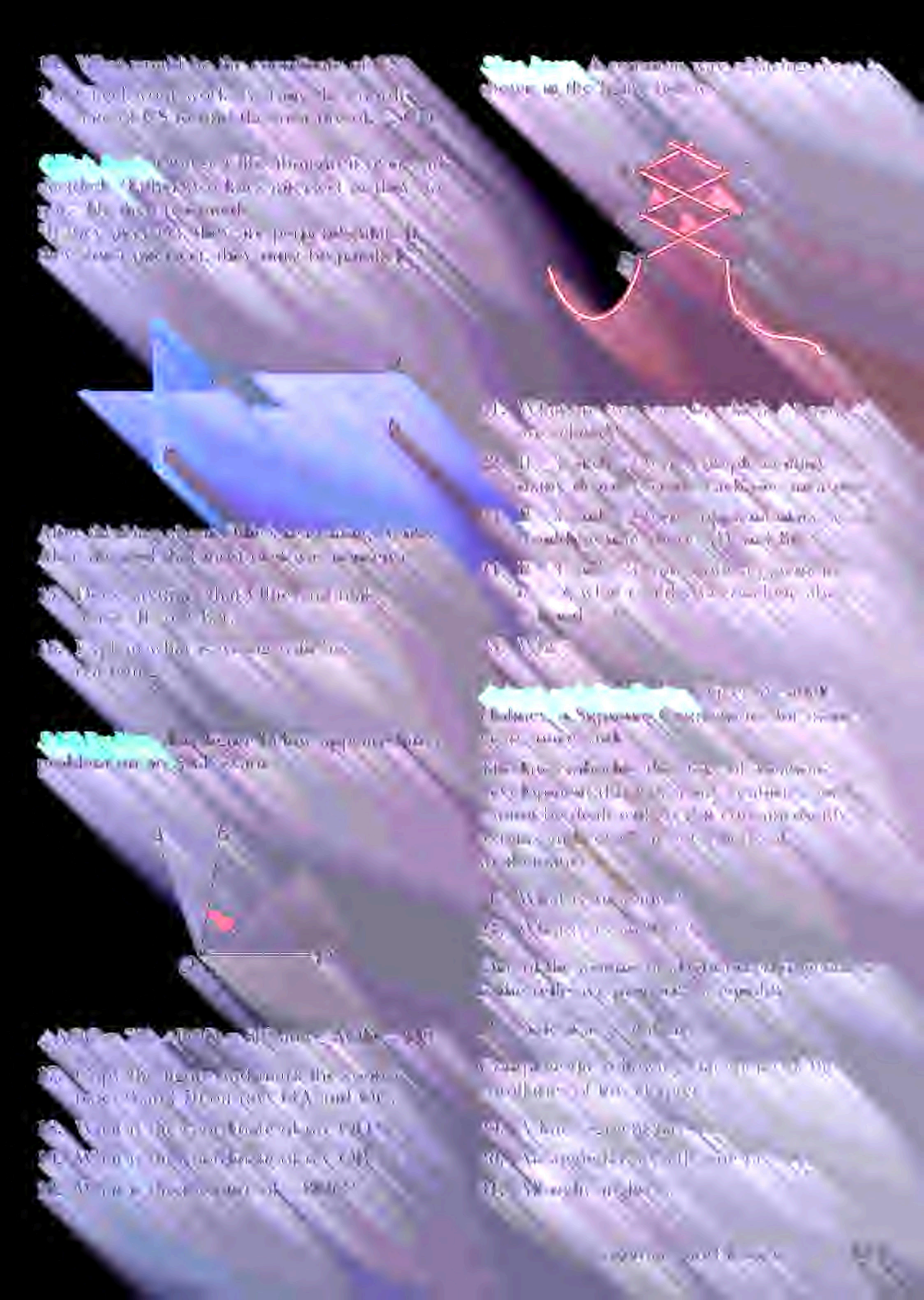






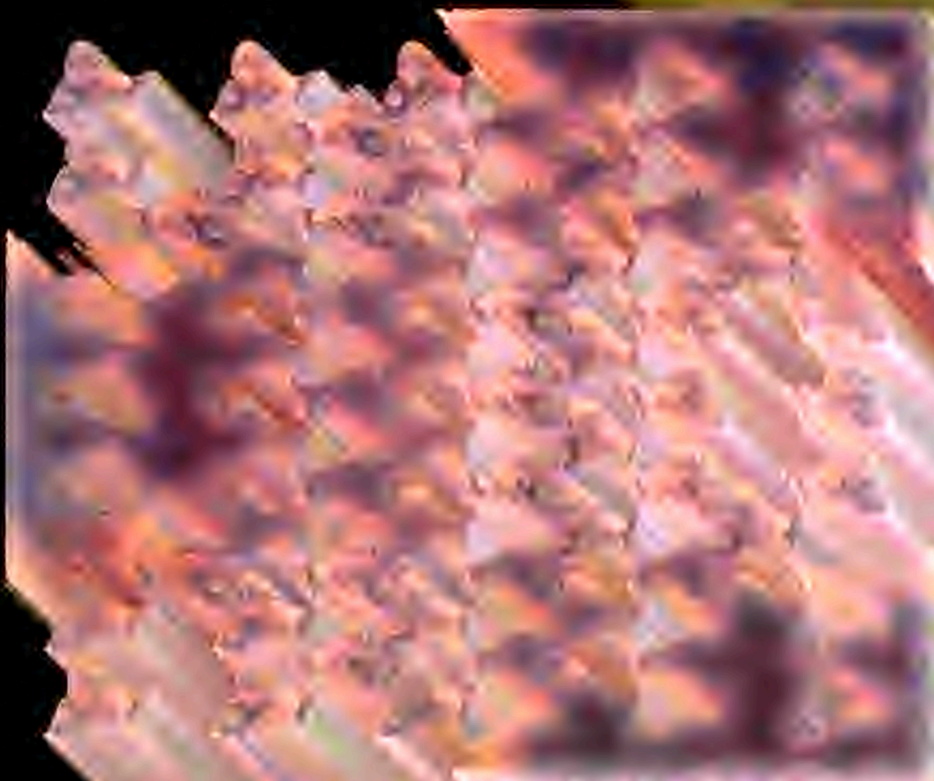






Chapter 4

Congruence



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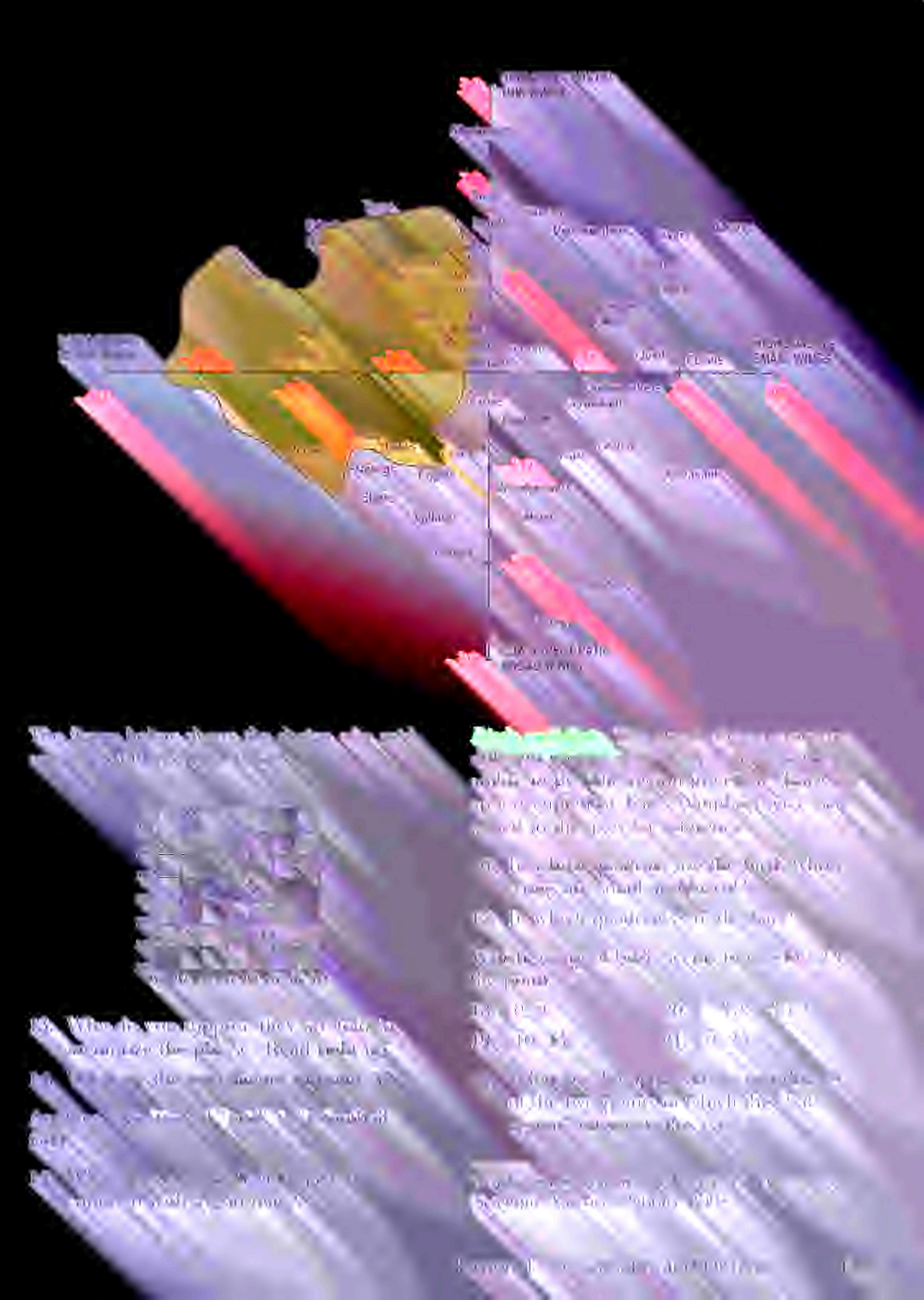

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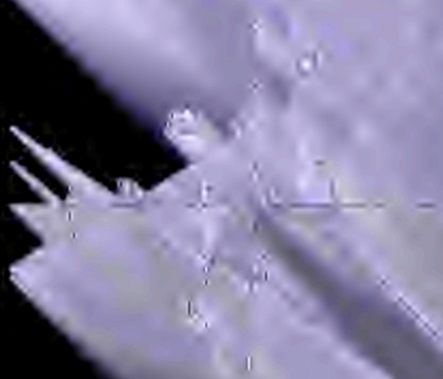

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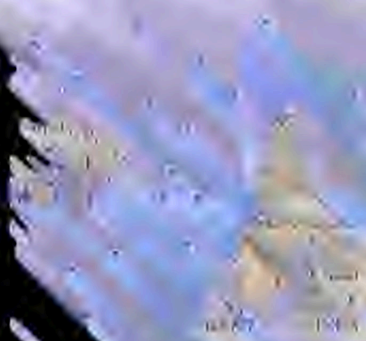

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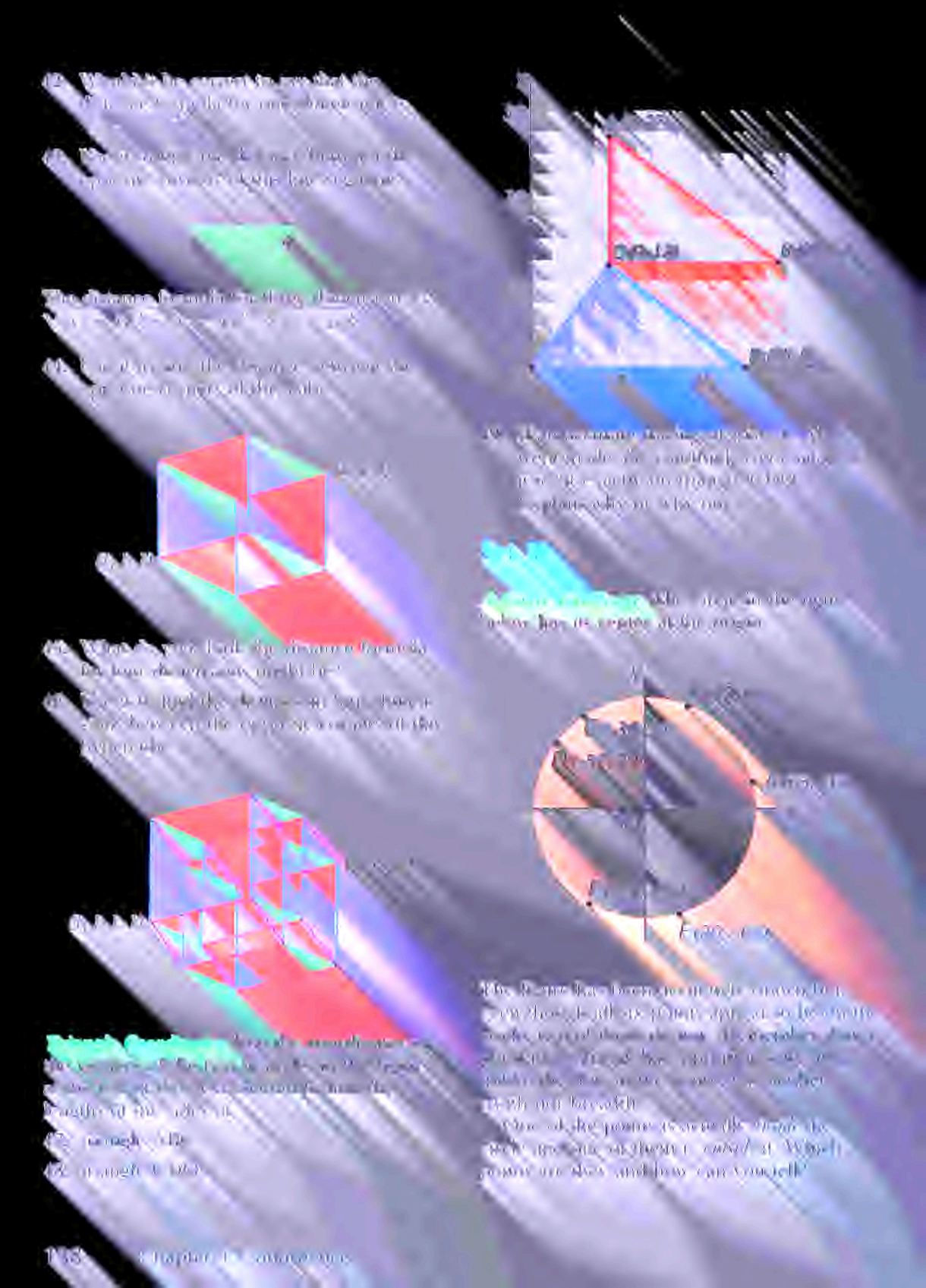
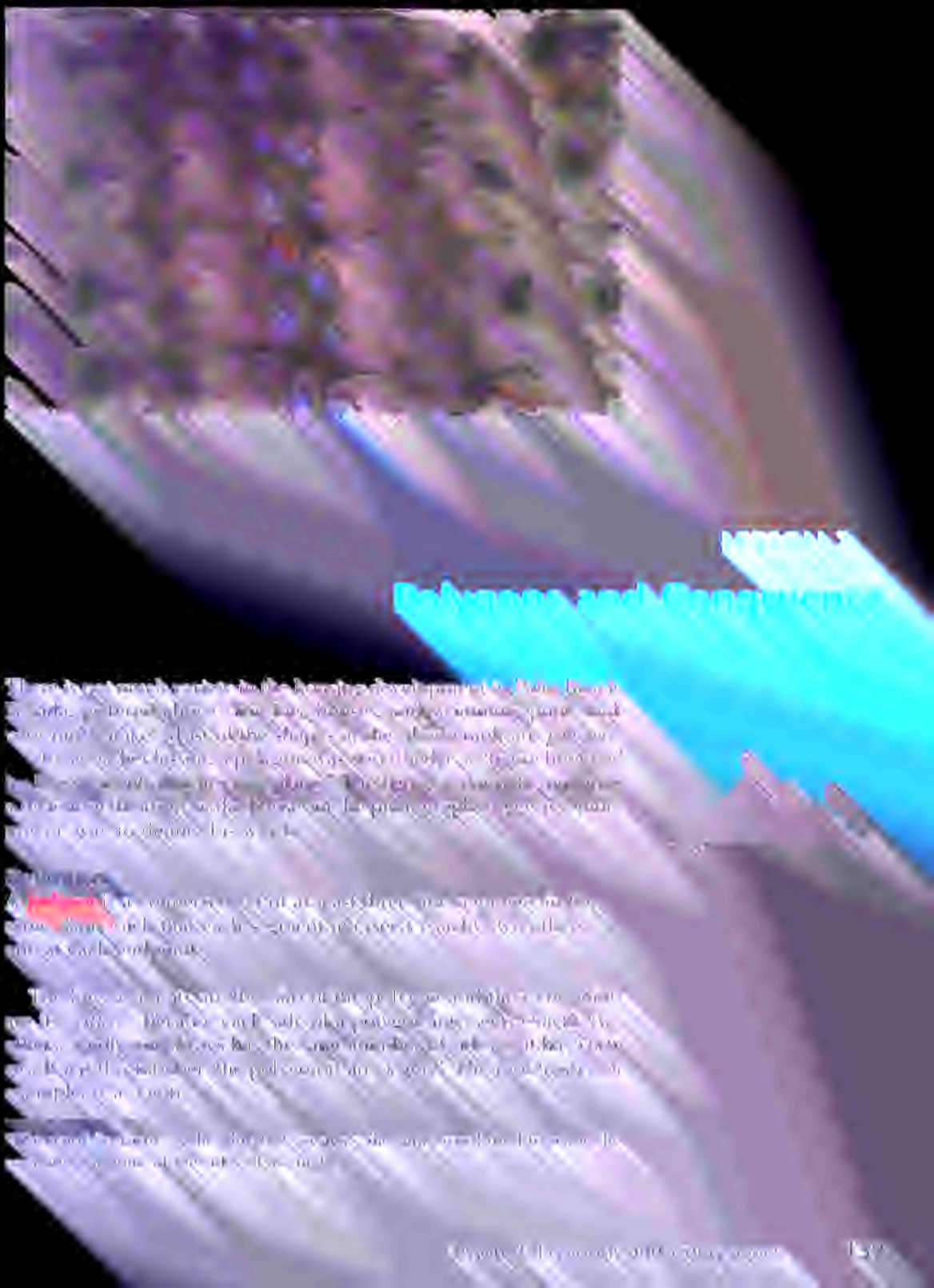
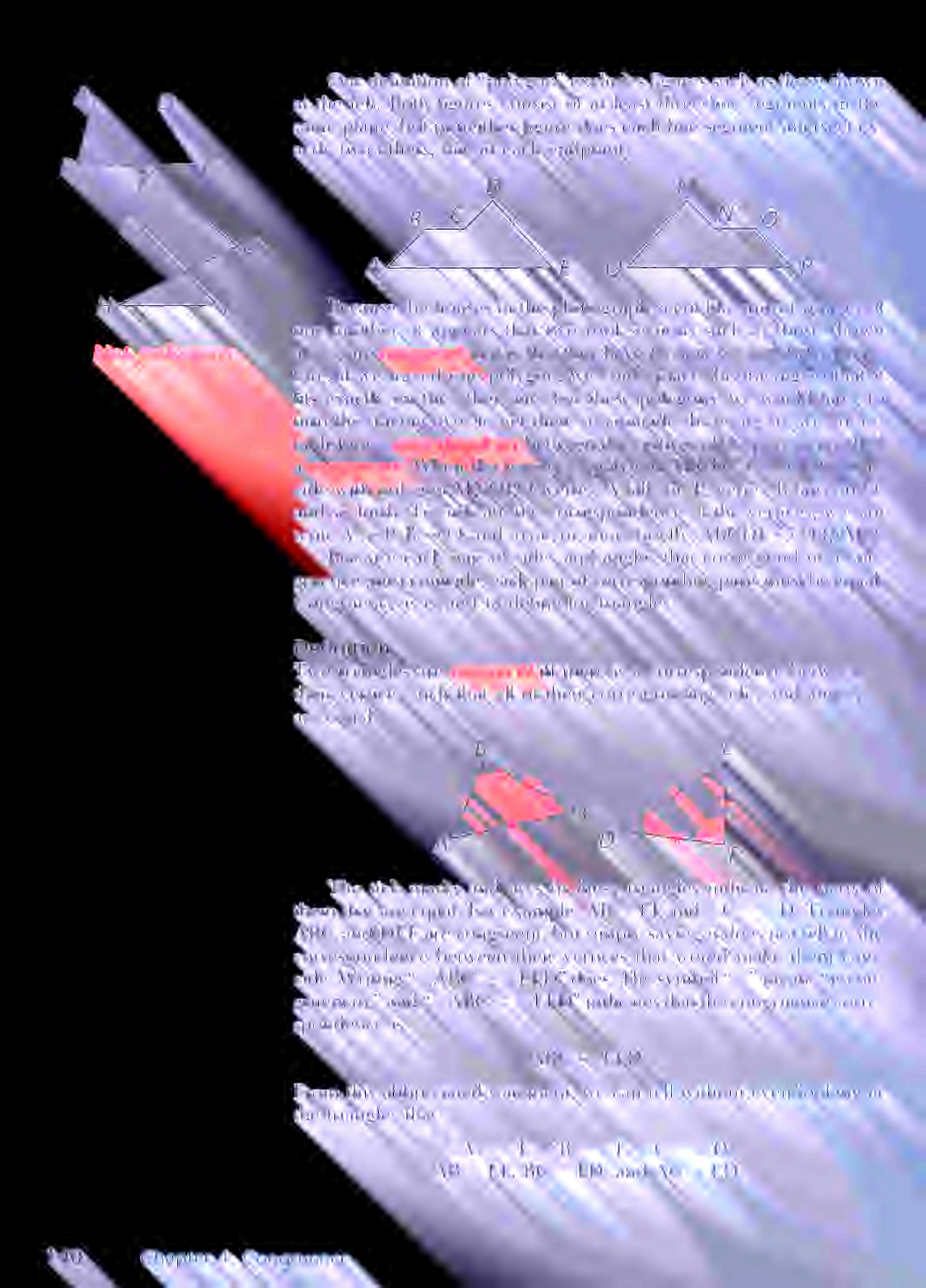




Polynomial Congruence















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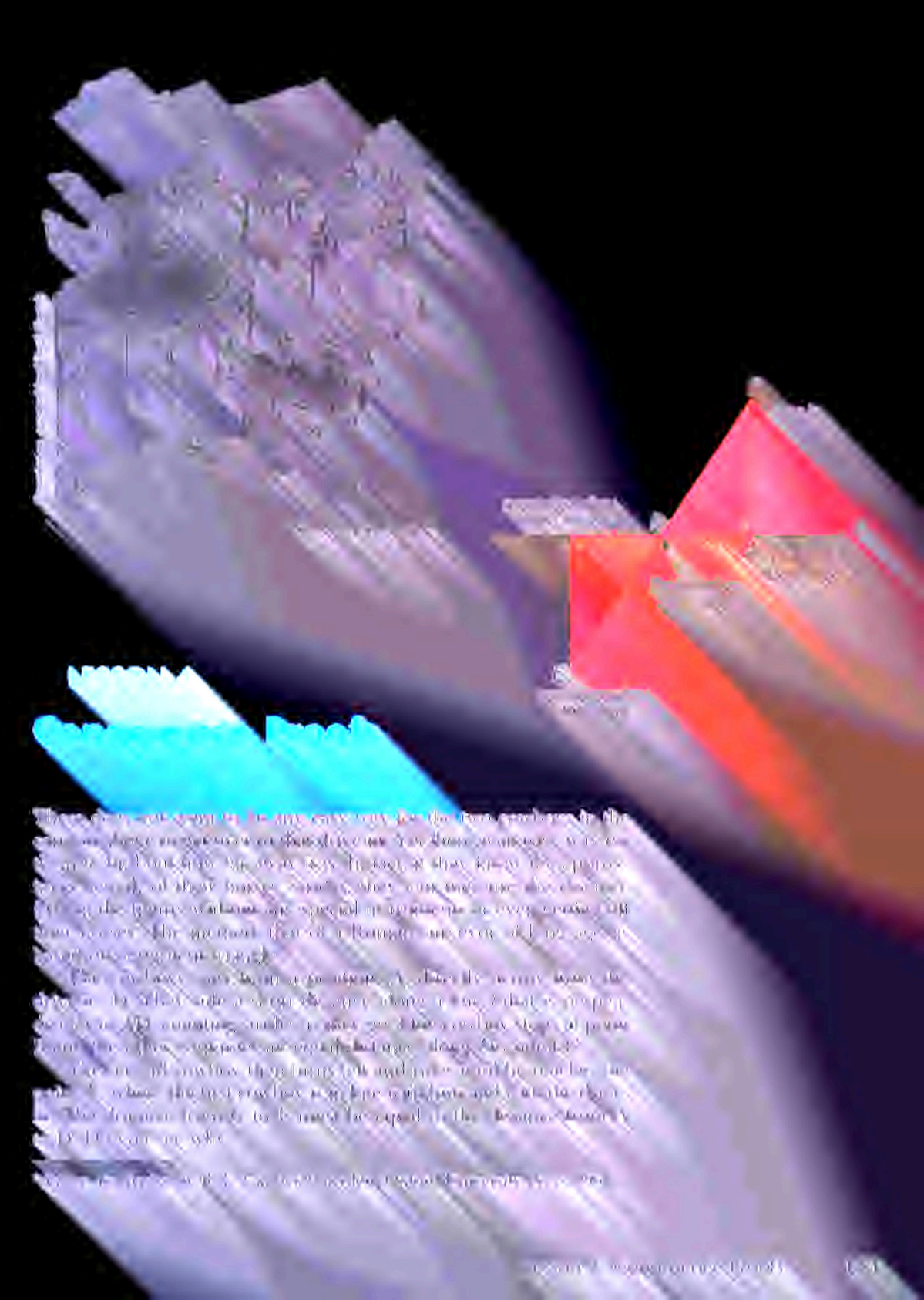

It is known that two triangles in the figure shown at the left have the corresponding angles equal, and the corresponding sides opposite equal angles are equal. Thus, triangle ABC and triangle DEF are similar. Point out the order of corresponding vertices. Two triangles are said to be similar if there is a correspondence between their vertices such that the angles at corresponding vertices are equal and the sides opposite corresponding angles are proportional. Such triangles should not be confused with congruent triangles, which are triangles that have the same size and shape.

Exhibition (Teacher Reference)

[illegible]

The figure at the left shows the triangles with the parts that are known marked. Given the marked parts of the triangles, can the triangles be proved congruent? Have students discuss the triangles and explain why ASA, AAS, or the side-angle-side relationship is not sufficient to prove the triangles congruent.

Given: $\triangle ABC \sim \triangle DEF$; $\angle A$ and $\angle D$ are right angles; $\angle B$ and $\angle E$ are right angles; $\angle C \cong \angle F$

Prove: $\triangle ABC \cong \triangle DEF$

Statements	Reasons
1. $\triangle ABC \sim \triangle DEF$	Given
2. $\angle A \cong \angle D$	Corresponding angles of similar triangles are equal
3. $\angle B \cong \angle E$	Given
4. $\angle A \cong \angle C$	All right angles are equal
5. $\angle B$ and $\angle E$ are the corresponding angles	Given
6. $\angle B \cong \angle E$	Given
7. $\angle B \cong \angle E$	Transitive property of equality
8. $\angle C \cong \angle F$	Given
9. $\angle C \cong \angle F$	Corresponding parts of congruent triangles are equal

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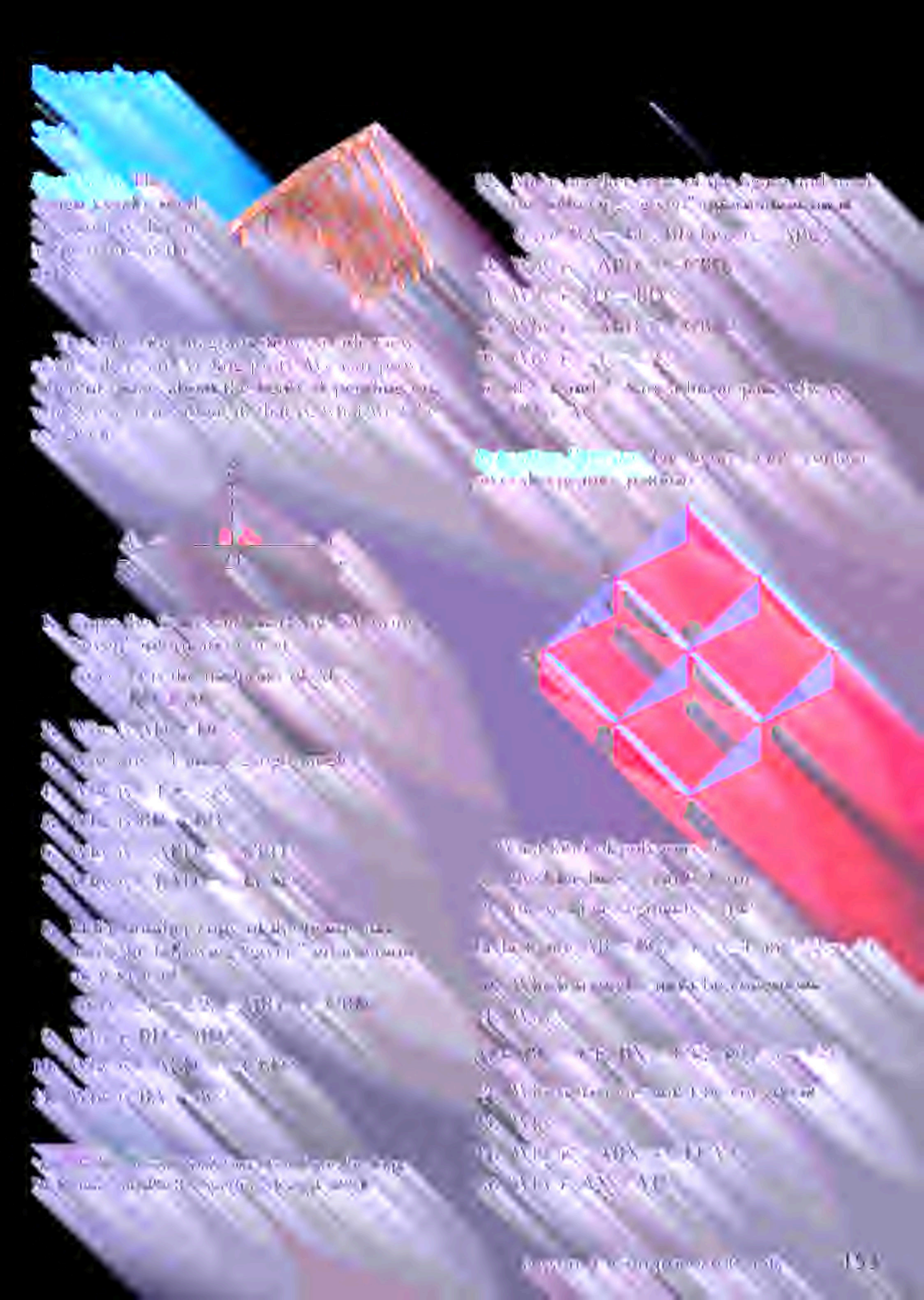
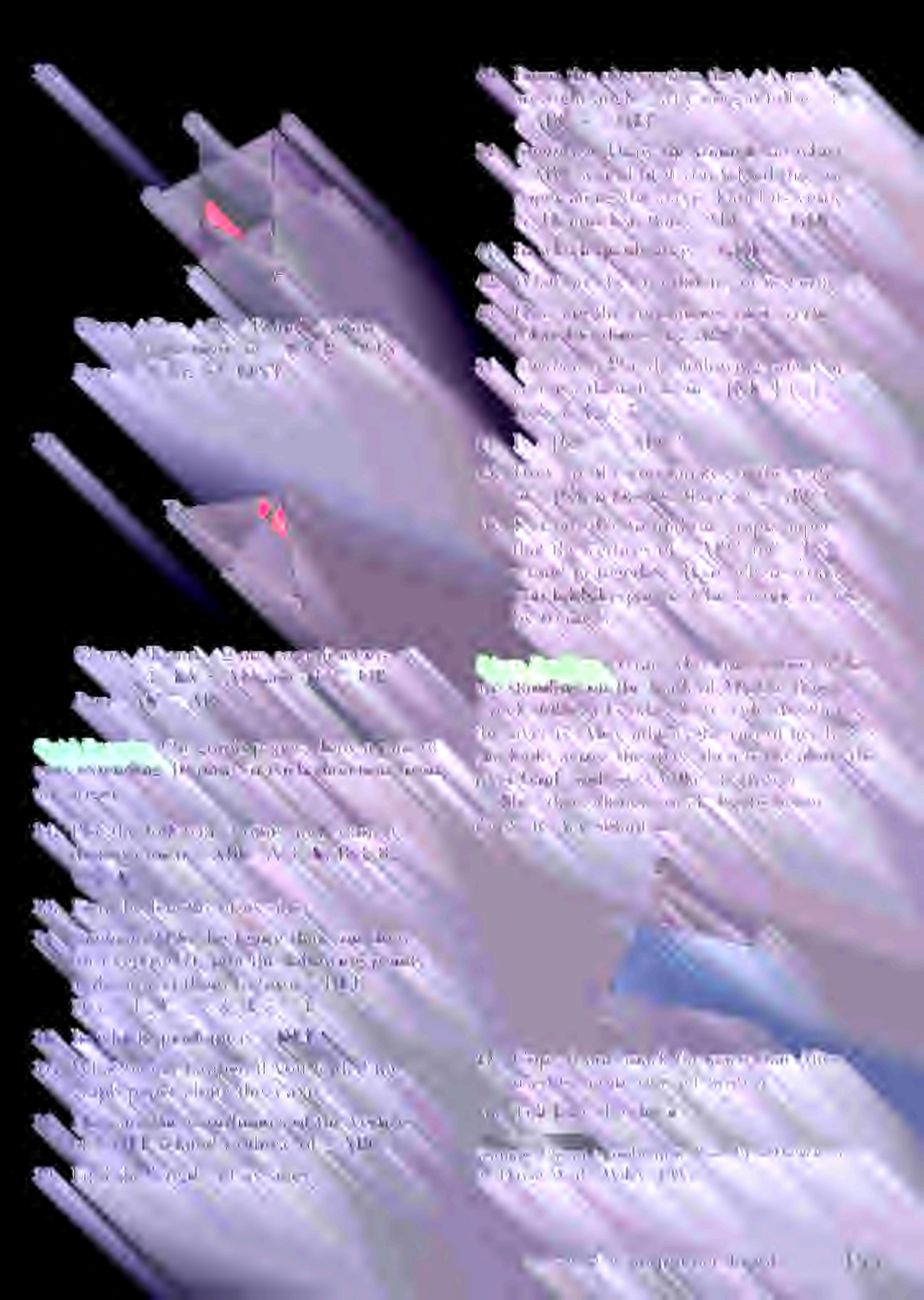
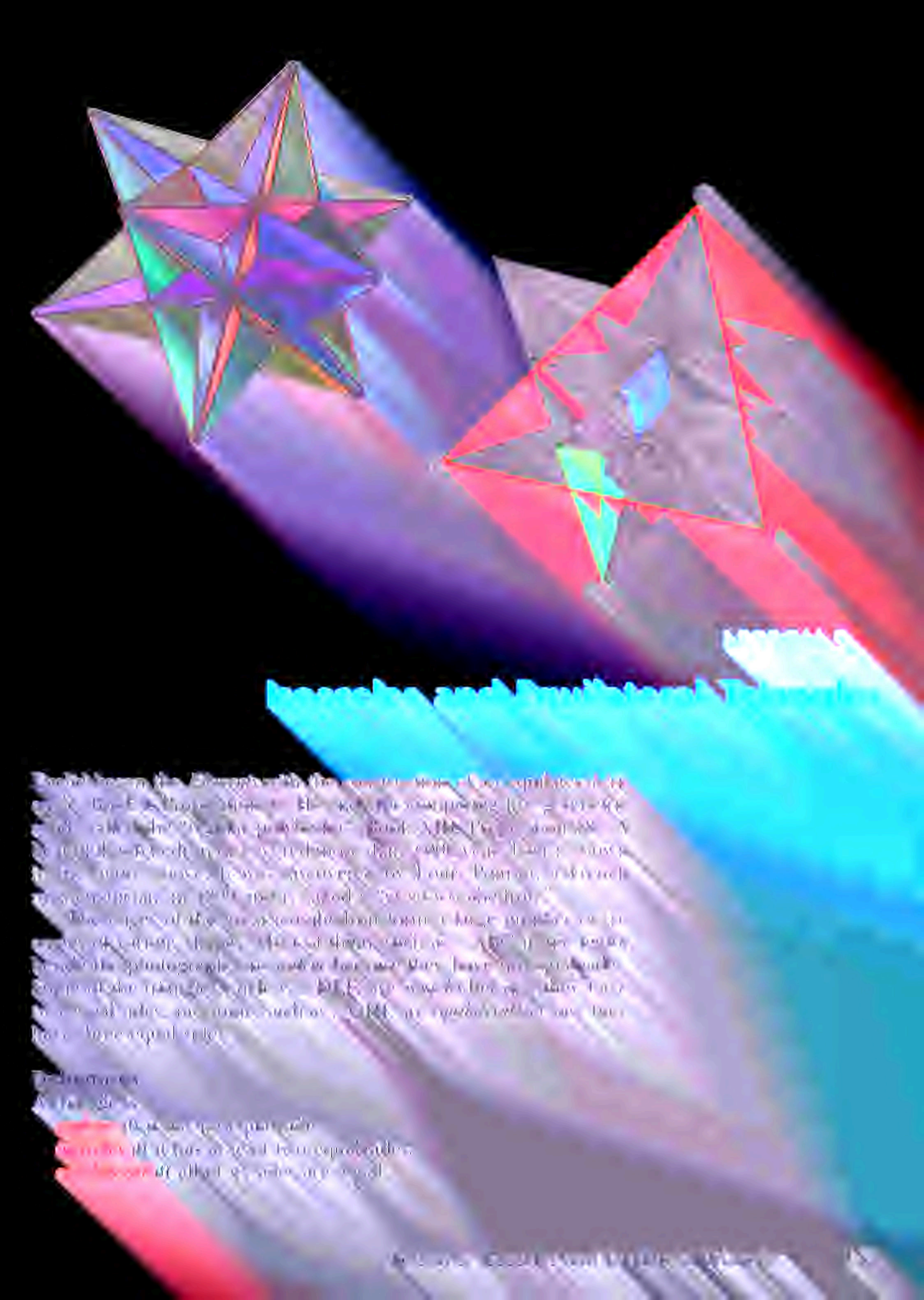
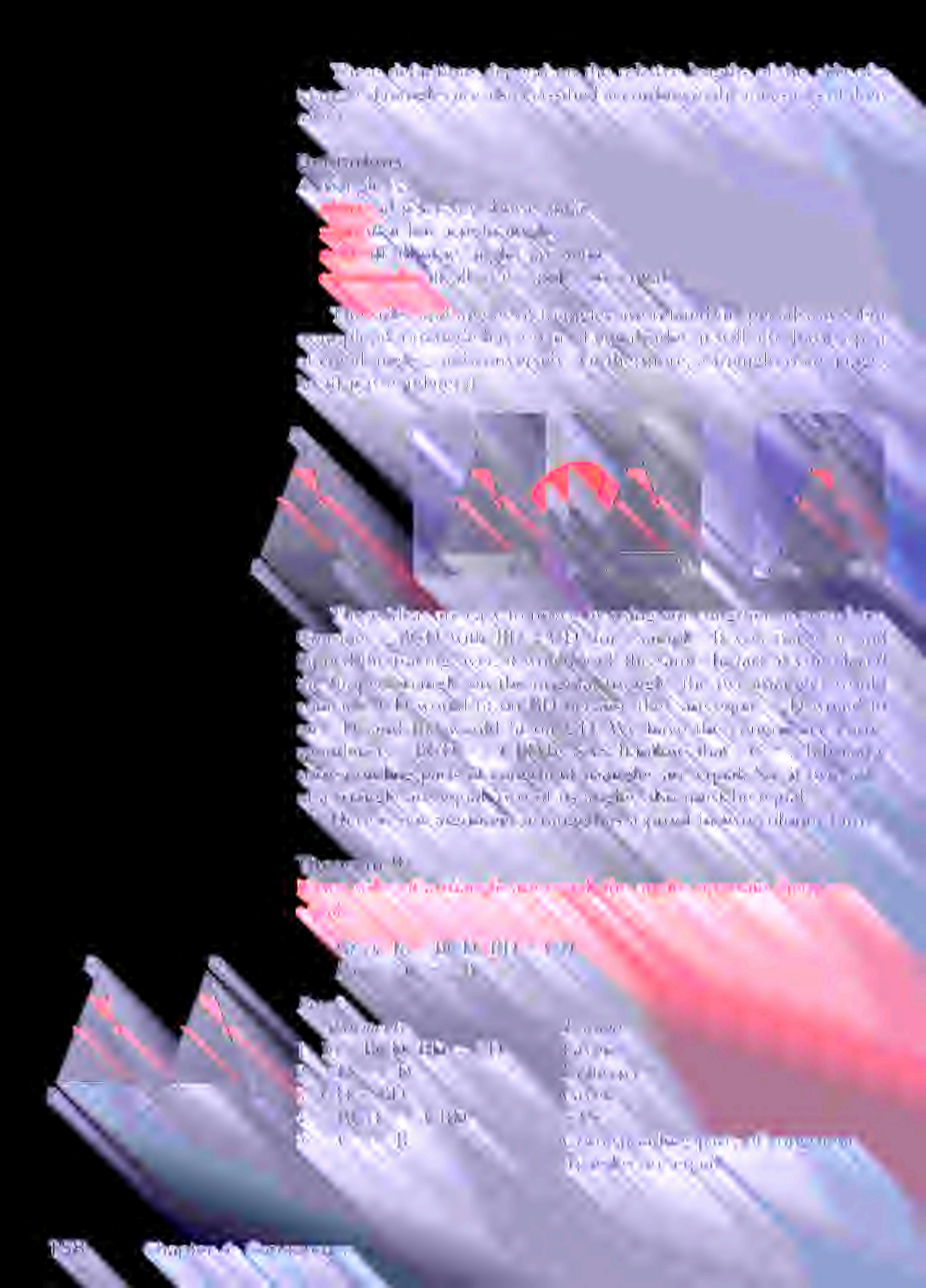


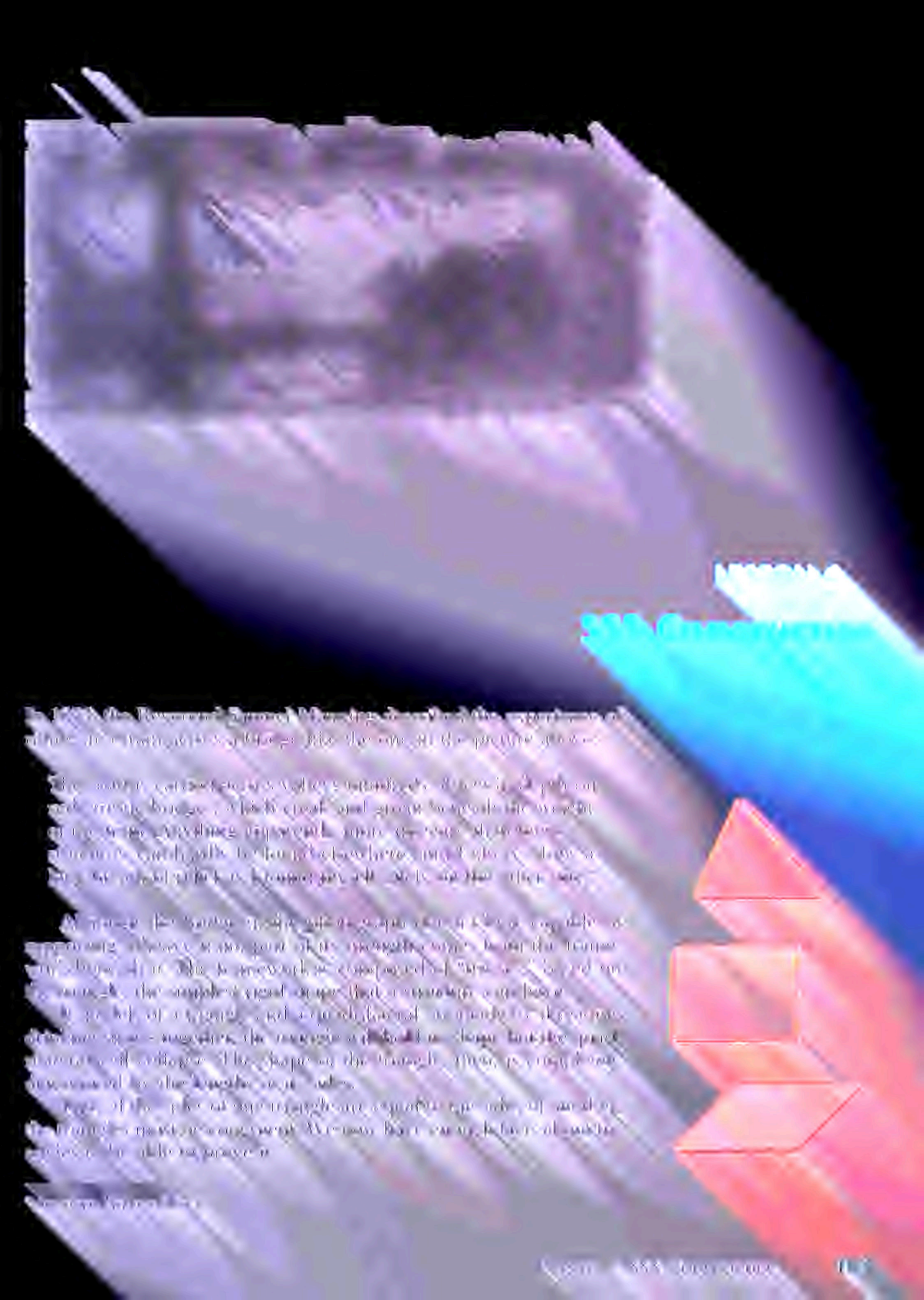






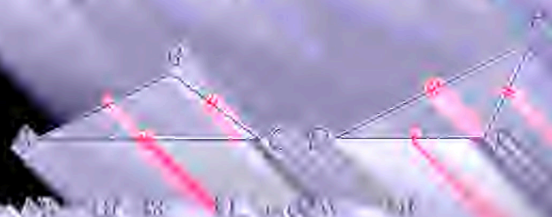






Theorem 11. The SSS Theorem.
Keep three sides of a triangle, or equivalently, the three sides of another triangle, the triangles are congruent.

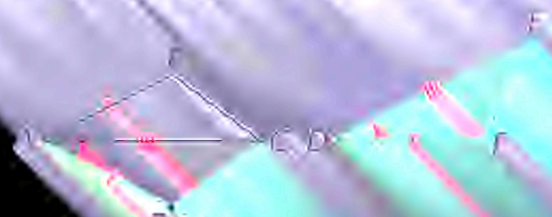
Our proof, that that of Euclidean Geometry, is one of the triangles and then showing that the other triangle is congruent to the first. The figure's illustrate the construction and proof.



Given $AB = DE$, $BC = EF$, and $CA = DF$.
Let $\triangle ABC = \triangle DEF$.

Proof.
The first part. Construction of a triangle $\triangle DEF$.

Let $\triangle ABC$ be a triangle. Let $\triangle DEF$ be a triangle. Let $\triangle ABC$ be a triangle. Let $\triangle DEF$ be a triangle. Let $\triangle ABC$ be a triangle. Let $\triangle DEF$ be a triangle. Let $\triangle ABC$ be a triangle. Let $\triangle DEF$ be a triangle.

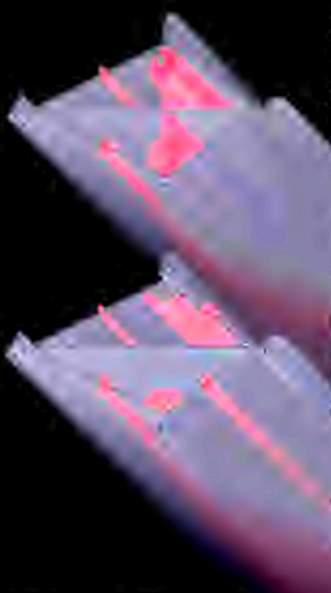


The second part. Construction of the triangle $\triangle ABC$.

Draw $BP = AC = DF$ and construct the point of congruence triangle are equal, and $AB = DE$ given, so $AC = AB$ substitution. From the information we know that $\triangle ABC$ is a triangle, so $\angle 1 = \angle 2$ at two sides of a triangle, so $\angle ABC$ is a triangle opposite them, so equal.

Also, $PC = FC$ corresponding parts of congruent triangles are equal, and $BC = EF$ given, so $PC = BC$ substitution. So $\triangle CBP$ is a triangle, and $\angle 3 = \angle 4$.

Because $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$, $\angle 1 + \angle 3 = \angle 2 + \angle 4$ substitution. Thus $\angle 1 + \angle 3 = \angle ABC$ and $\angle 2 + \angle 4 = \angle APC$. Both sides of Bayes Theorem which holds because BP divides both $\angle ABC$ and $\angle APC$, so $\angle ABC = \angle APC$ substitution. So in the information we know that $\angle ABC = \angle APC$. SAS. Finally, $\angle ABC = \angle DEF$ because two triangles congruent to a third triangle are congruent to each other.



The proof of this theorem is very easy. You should learn the SSS theorem. Although it is also reversible, it is a theorem when two sides are interpreted as SSS.



Chemistry Lesson

Question Prop. 2

Prove it for a general



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Construction 3

Prove it for a



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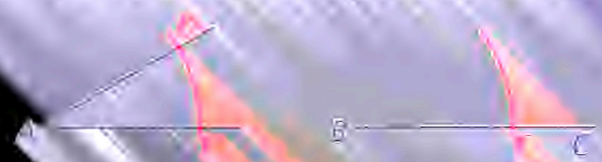

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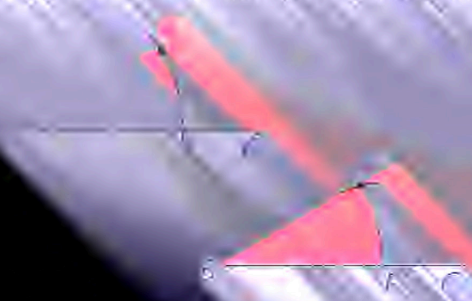

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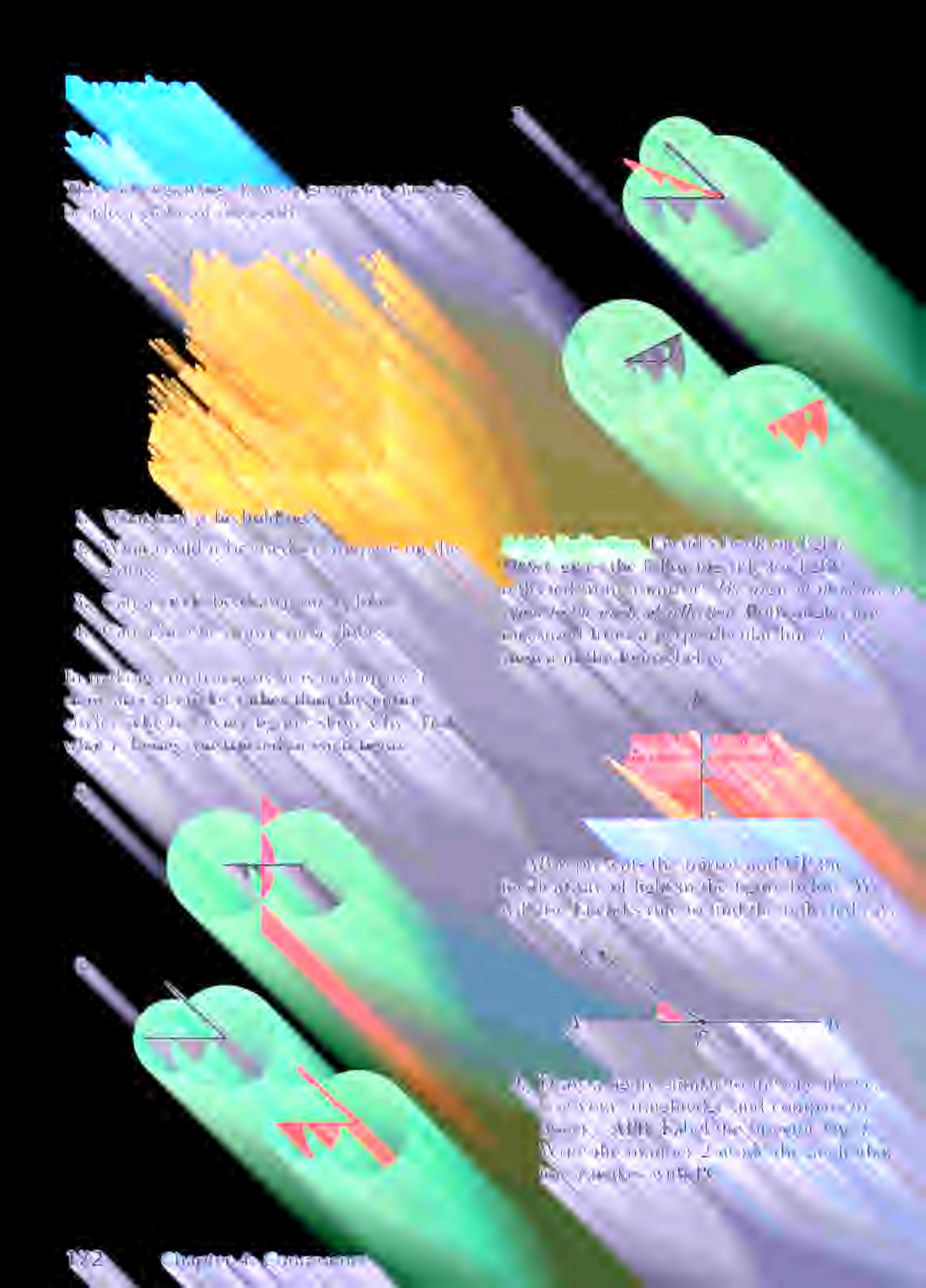







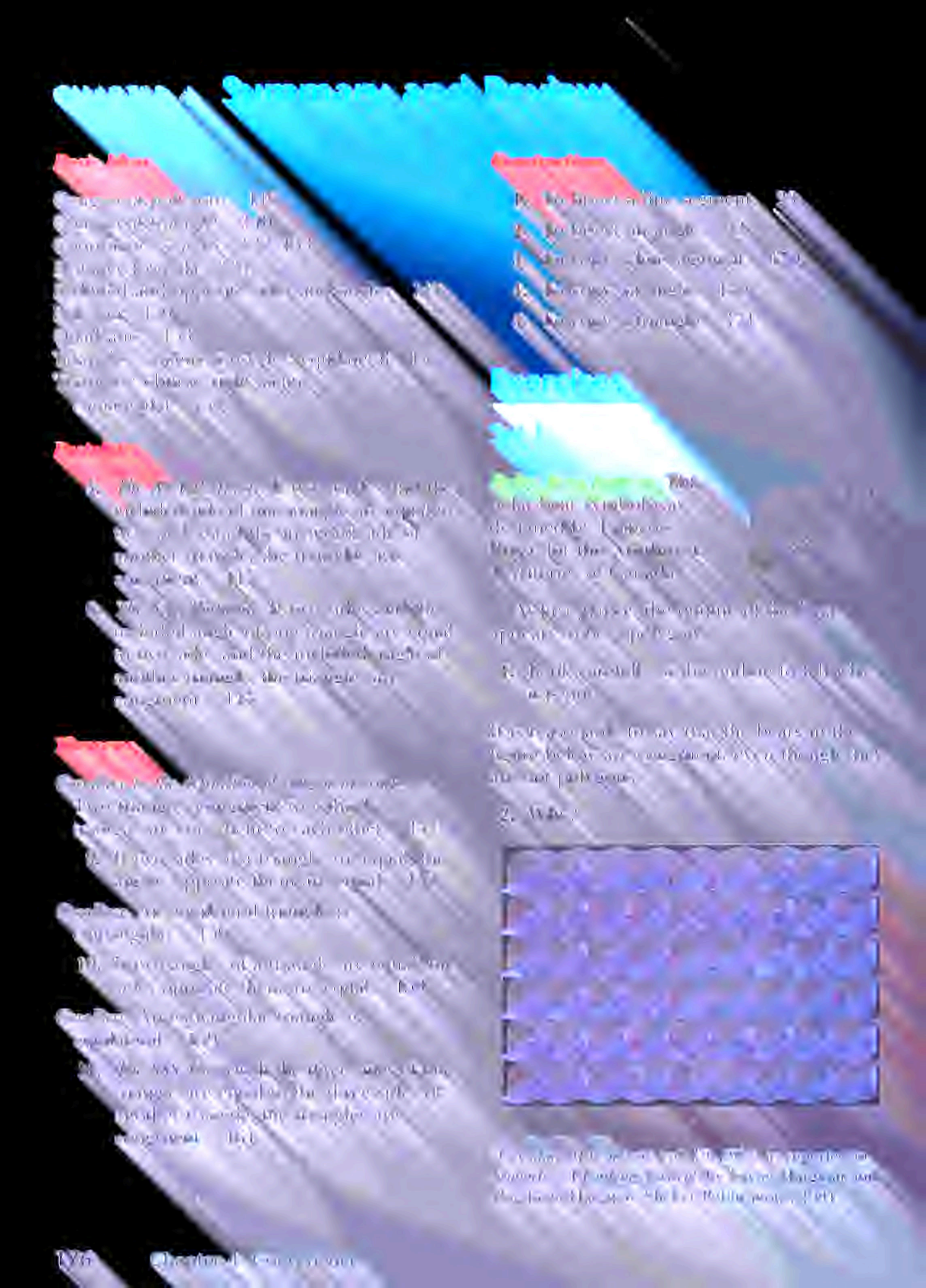





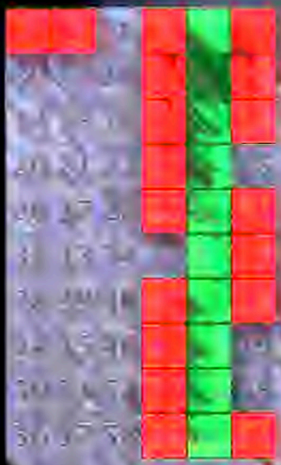

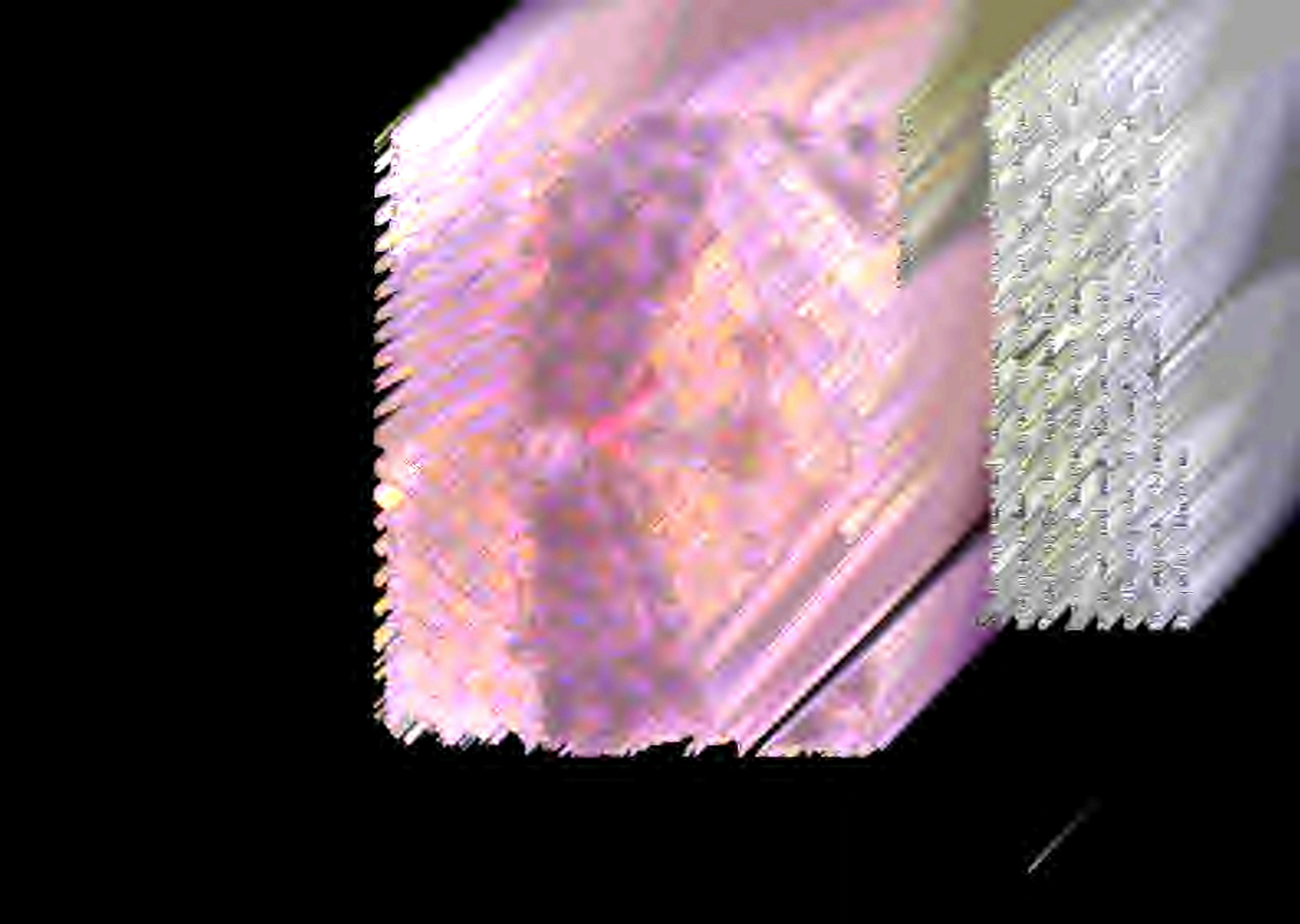

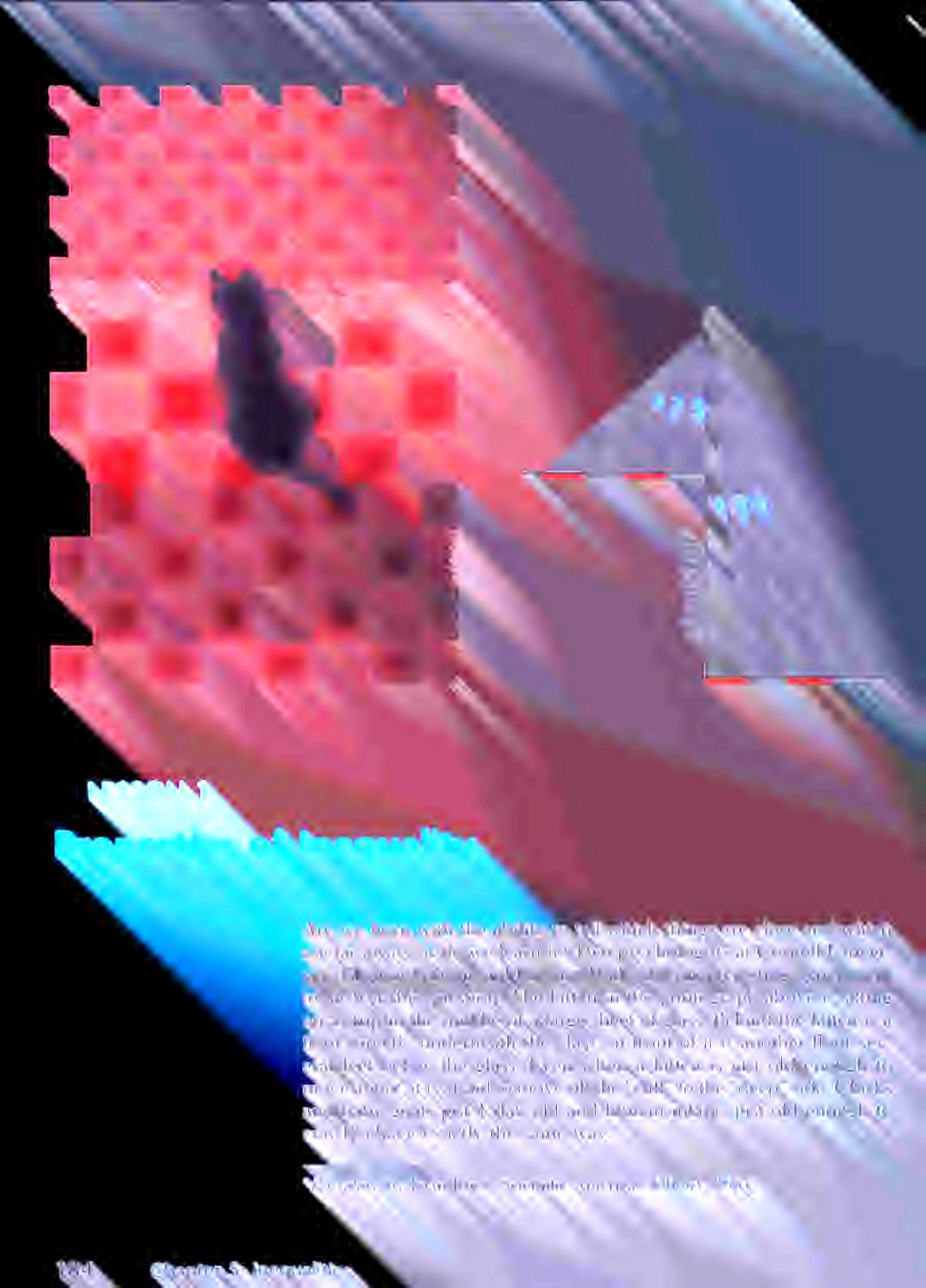









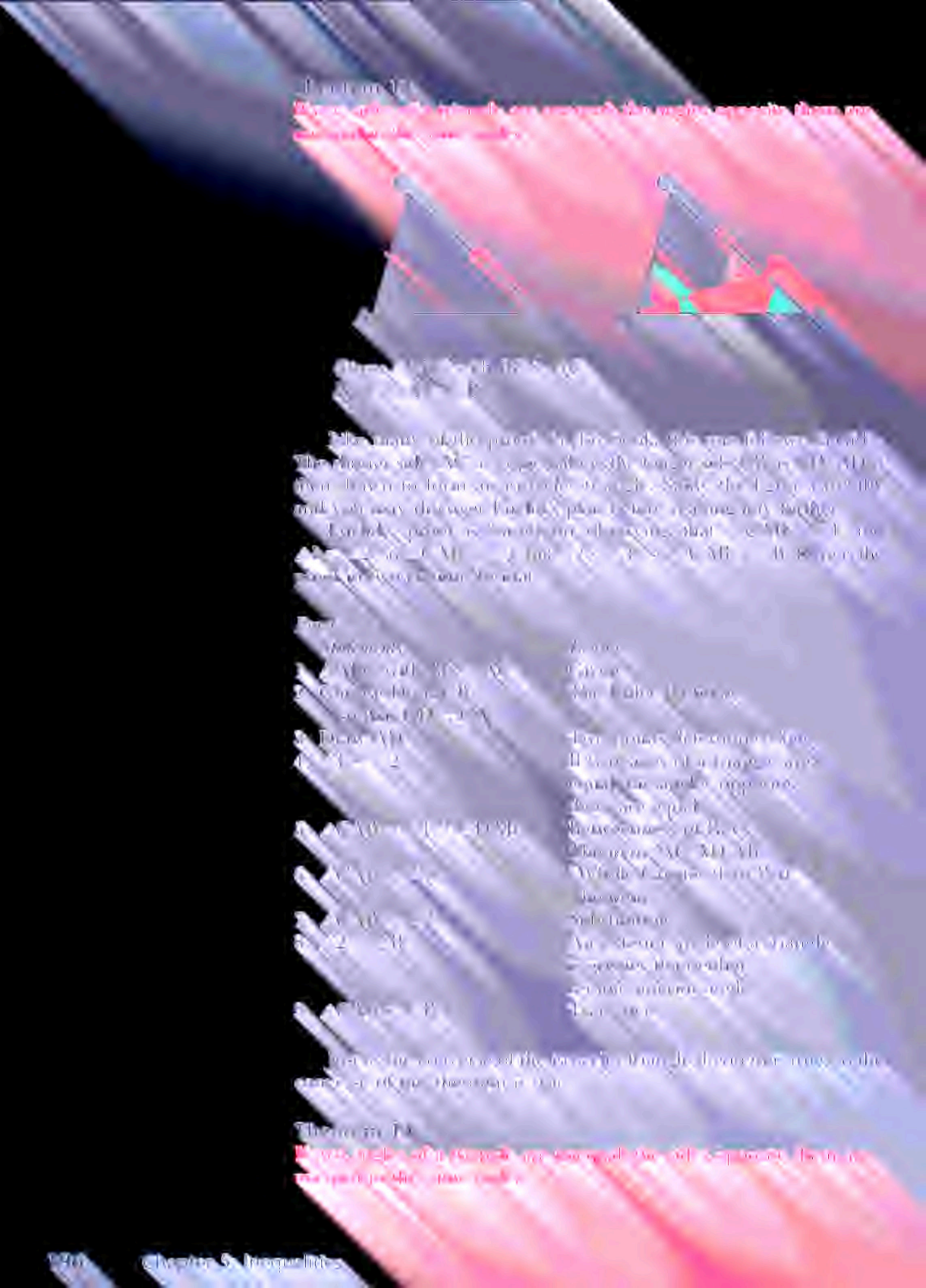





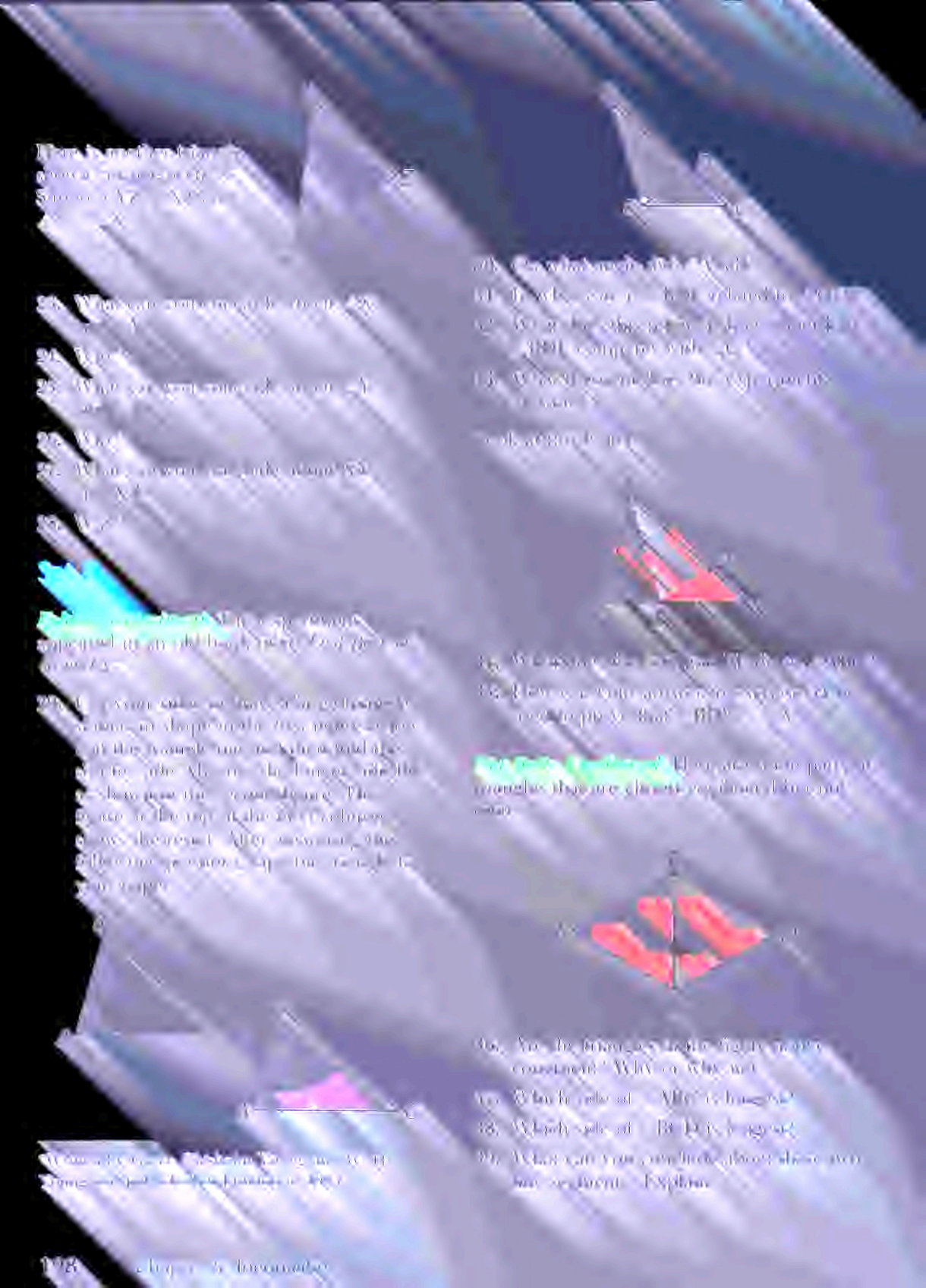







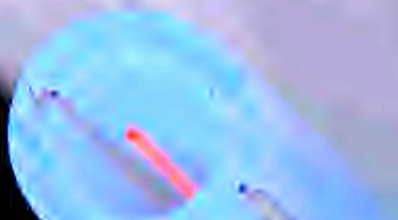



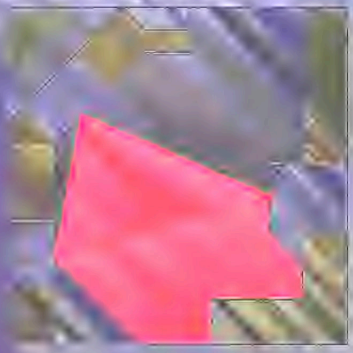







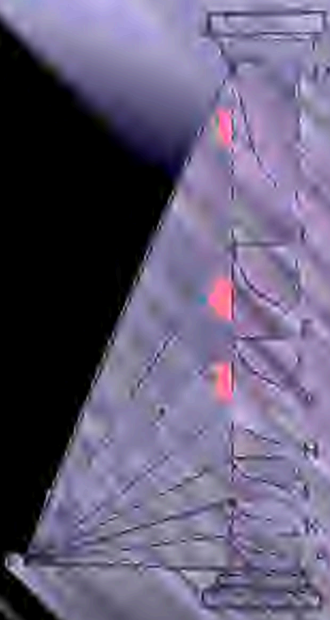



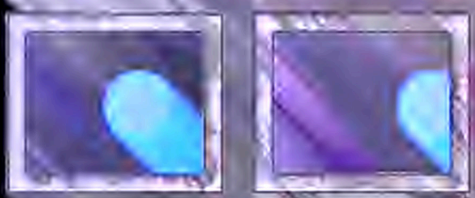









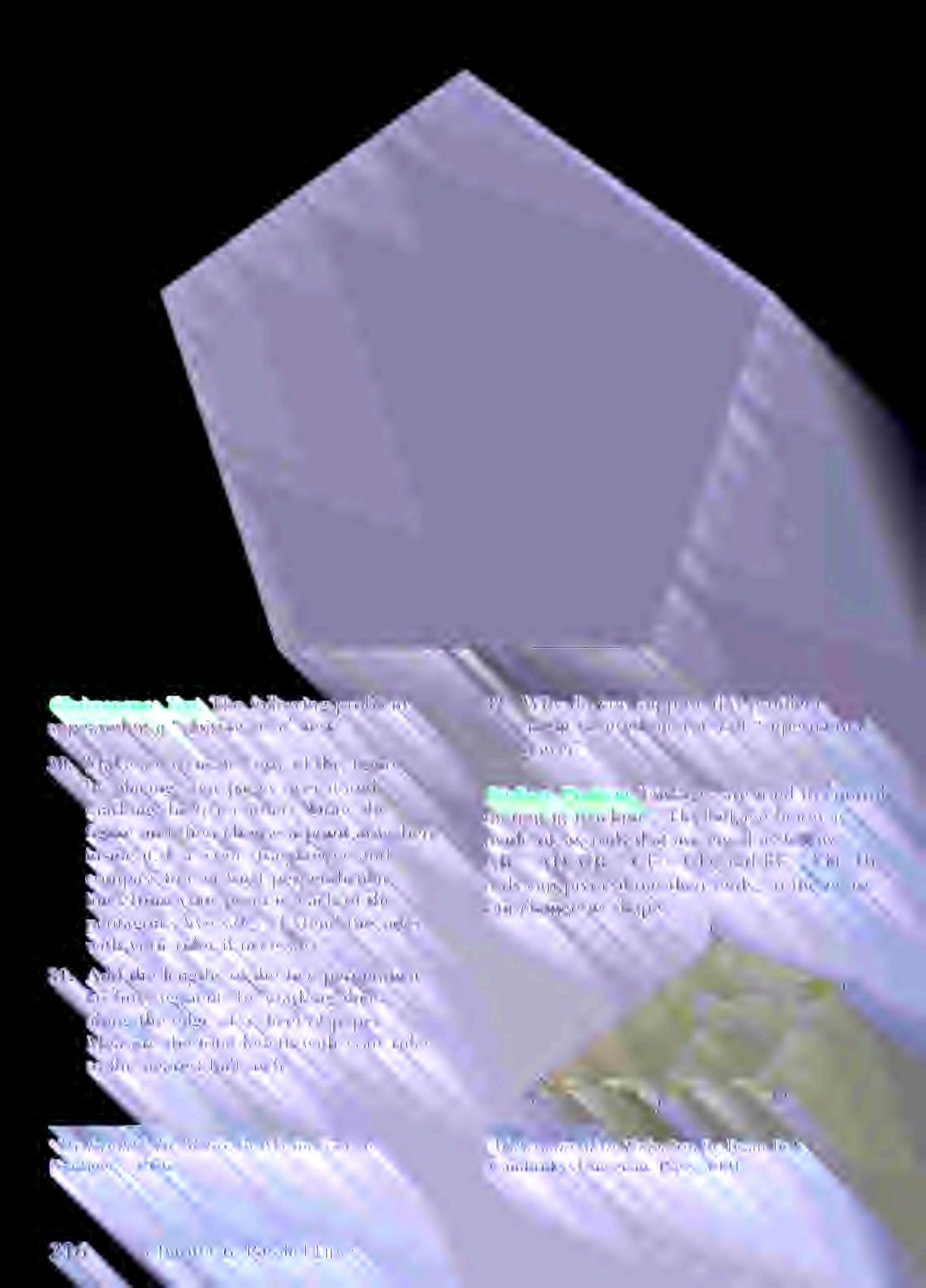

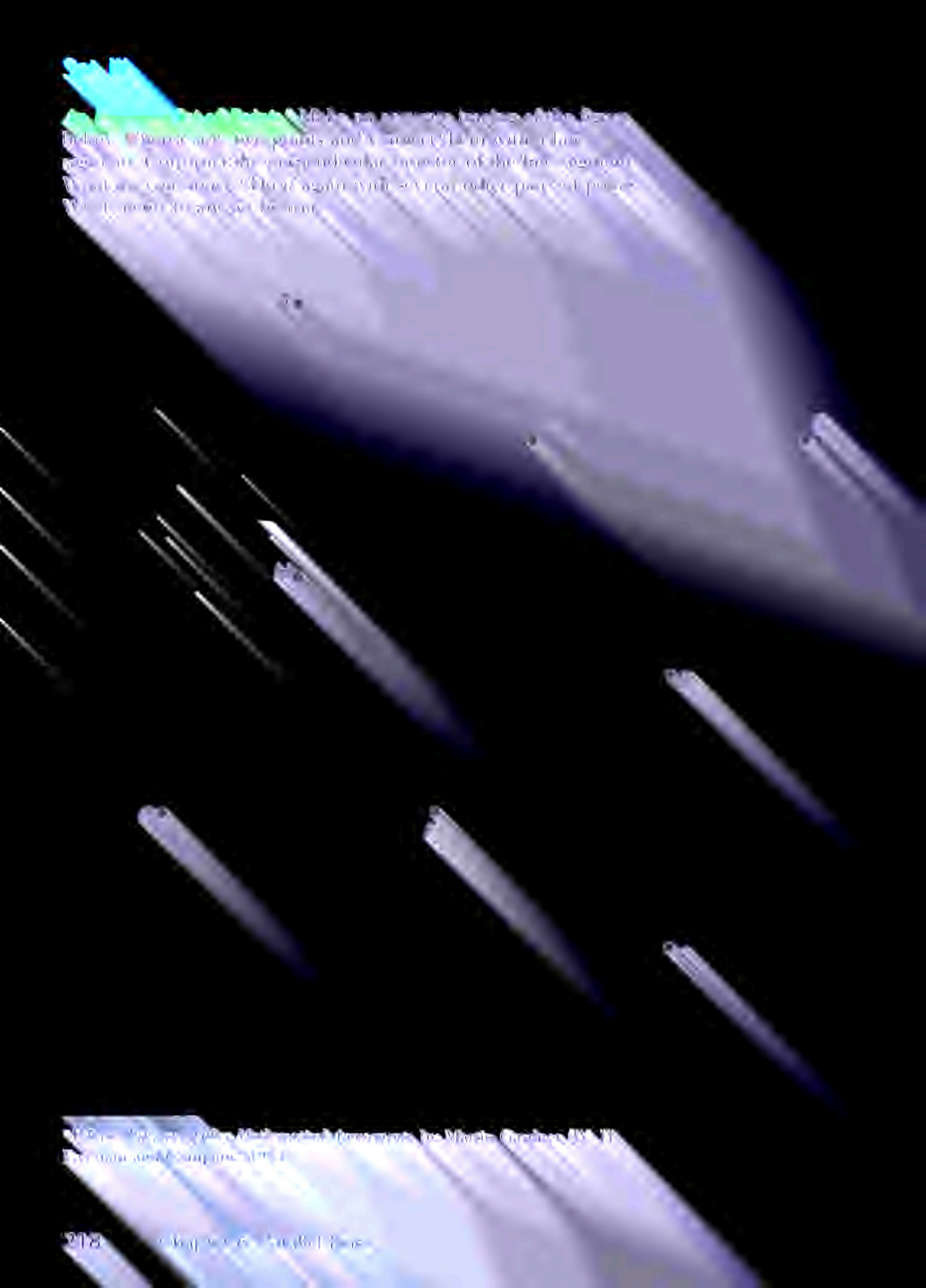

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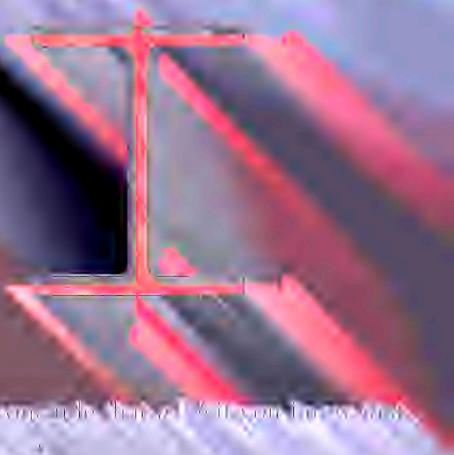
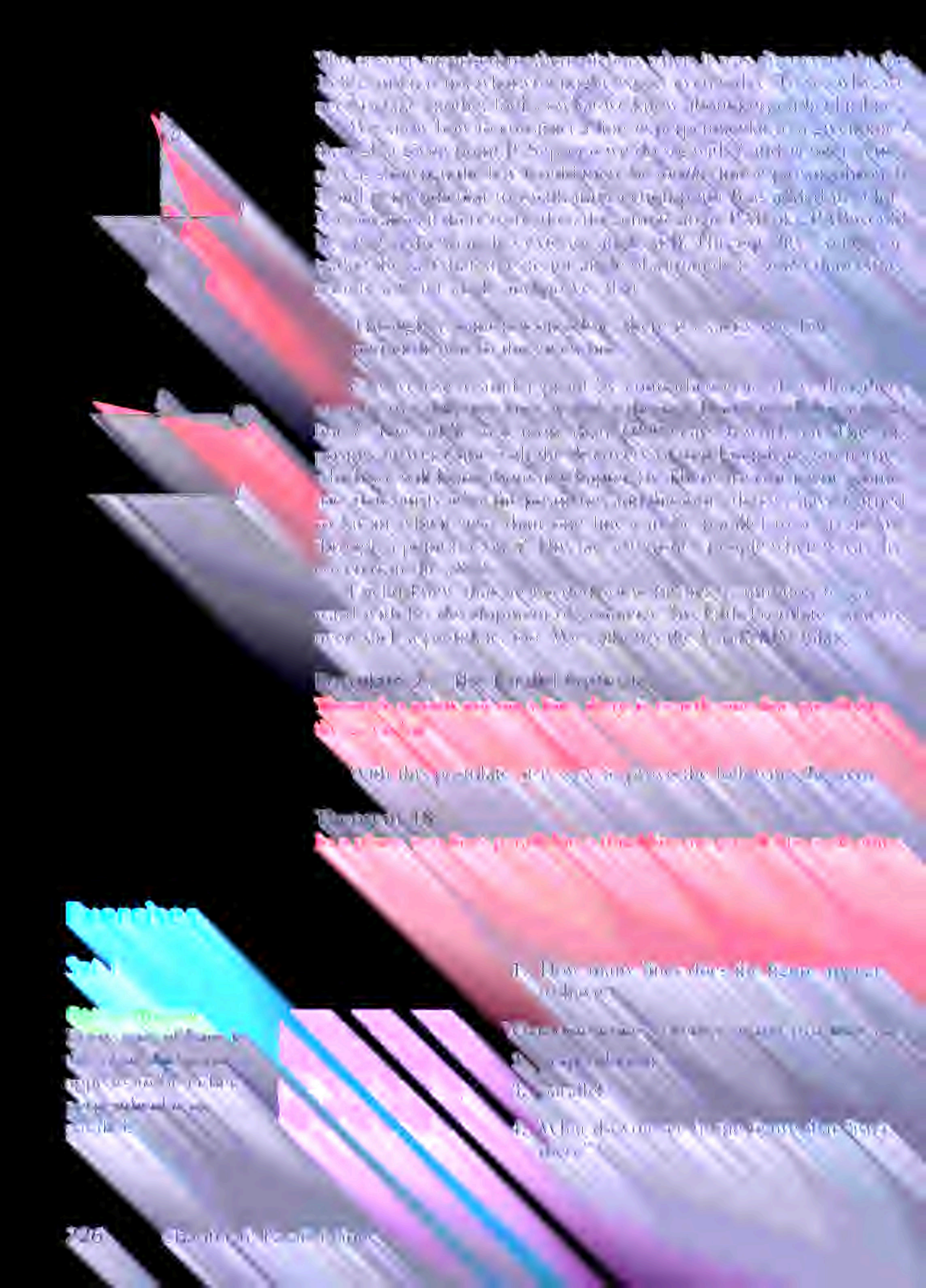
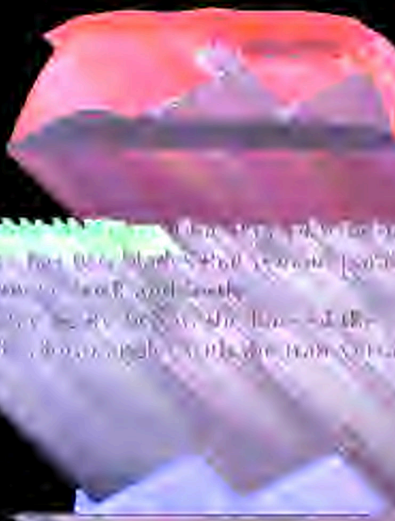
















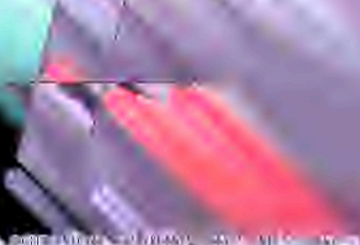


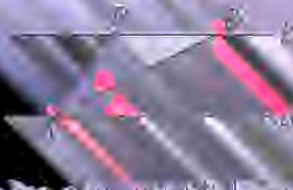


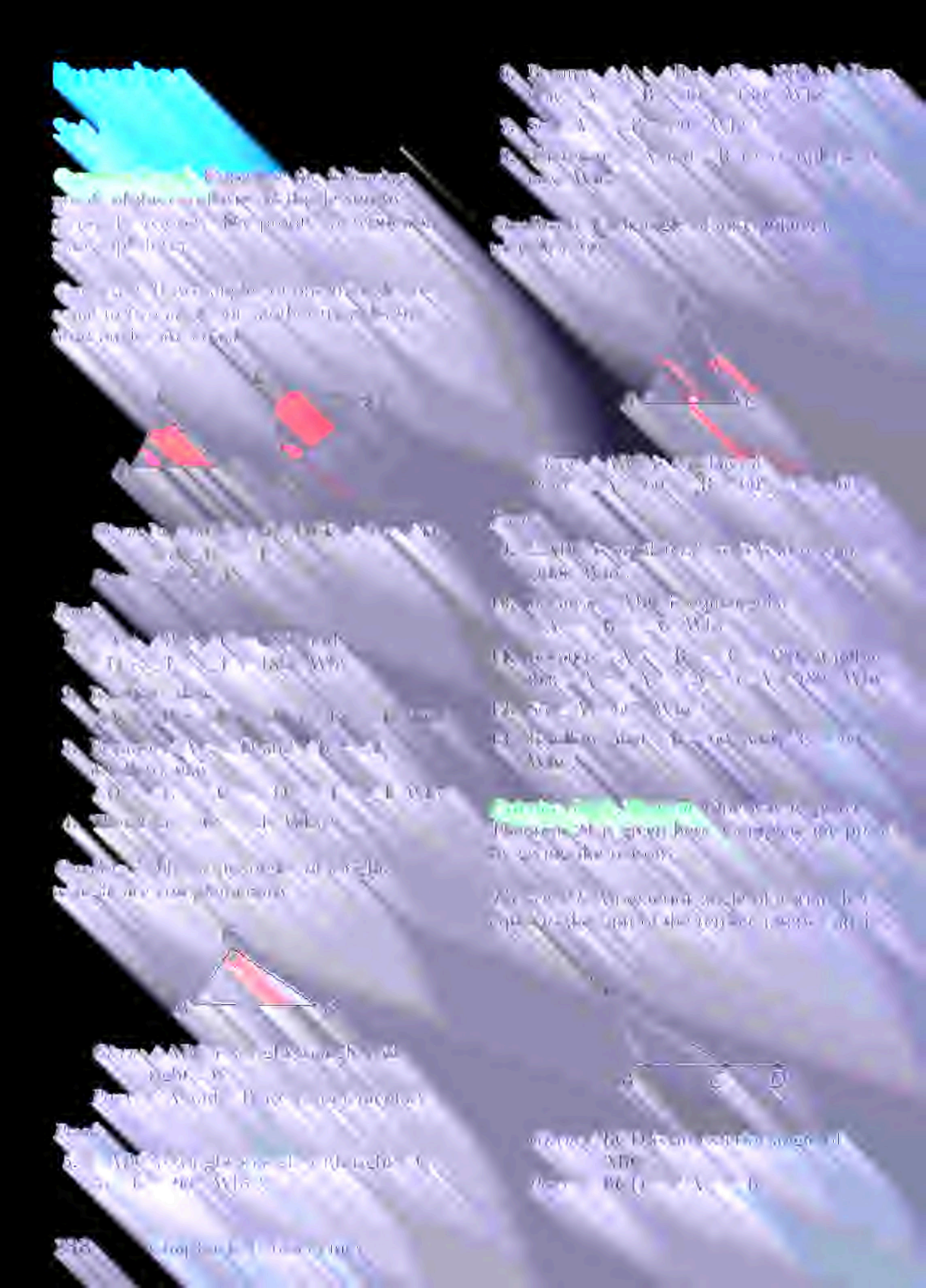






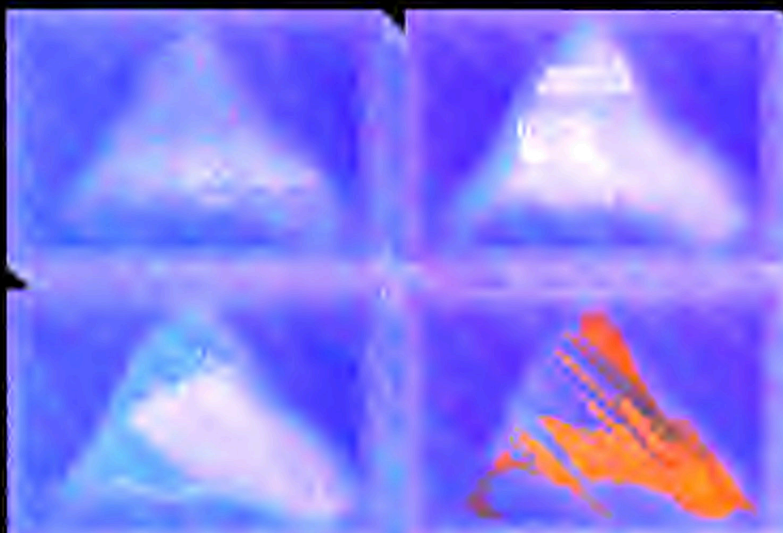




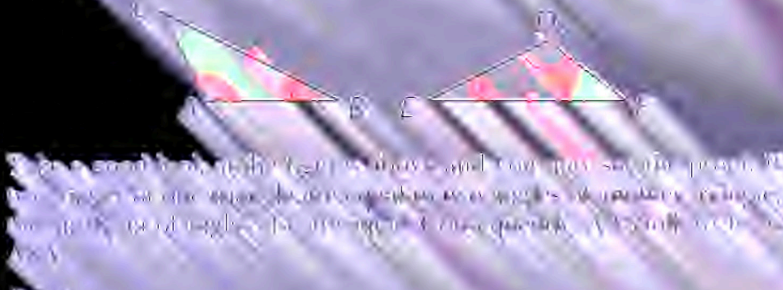


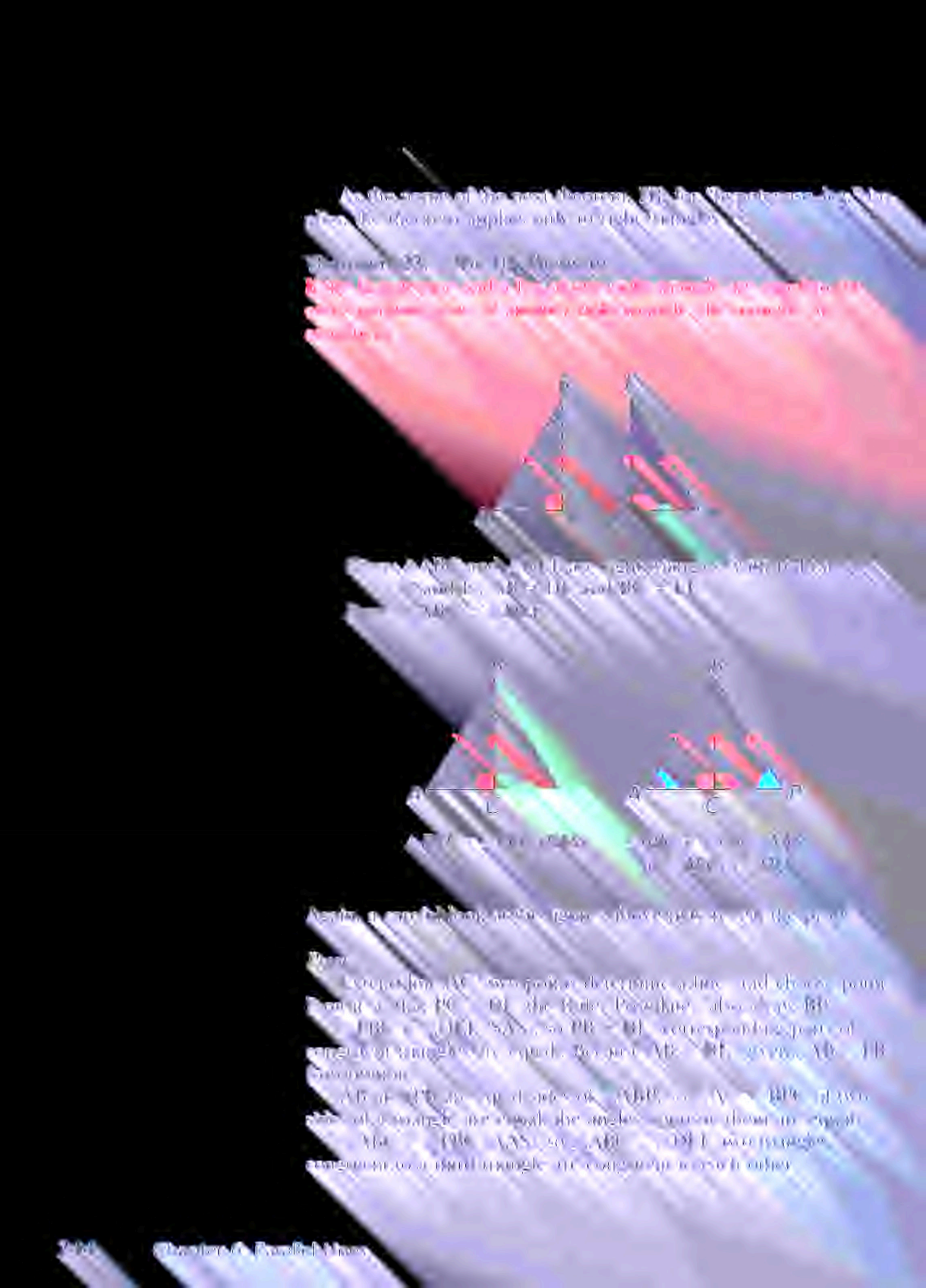






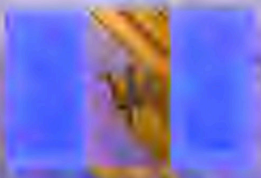


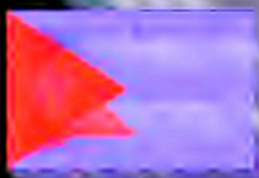


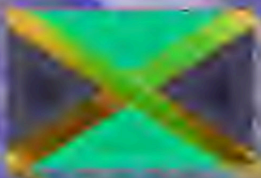


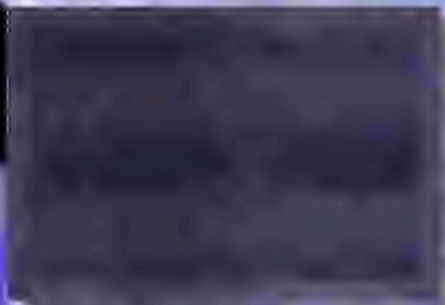














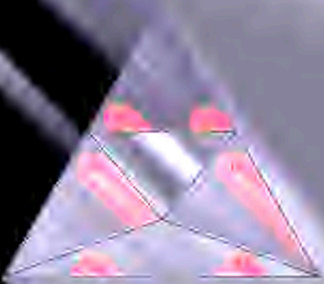
19. [illegible]

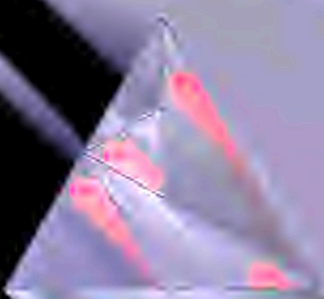


[illegible]

20. [illegible]







[illegible]

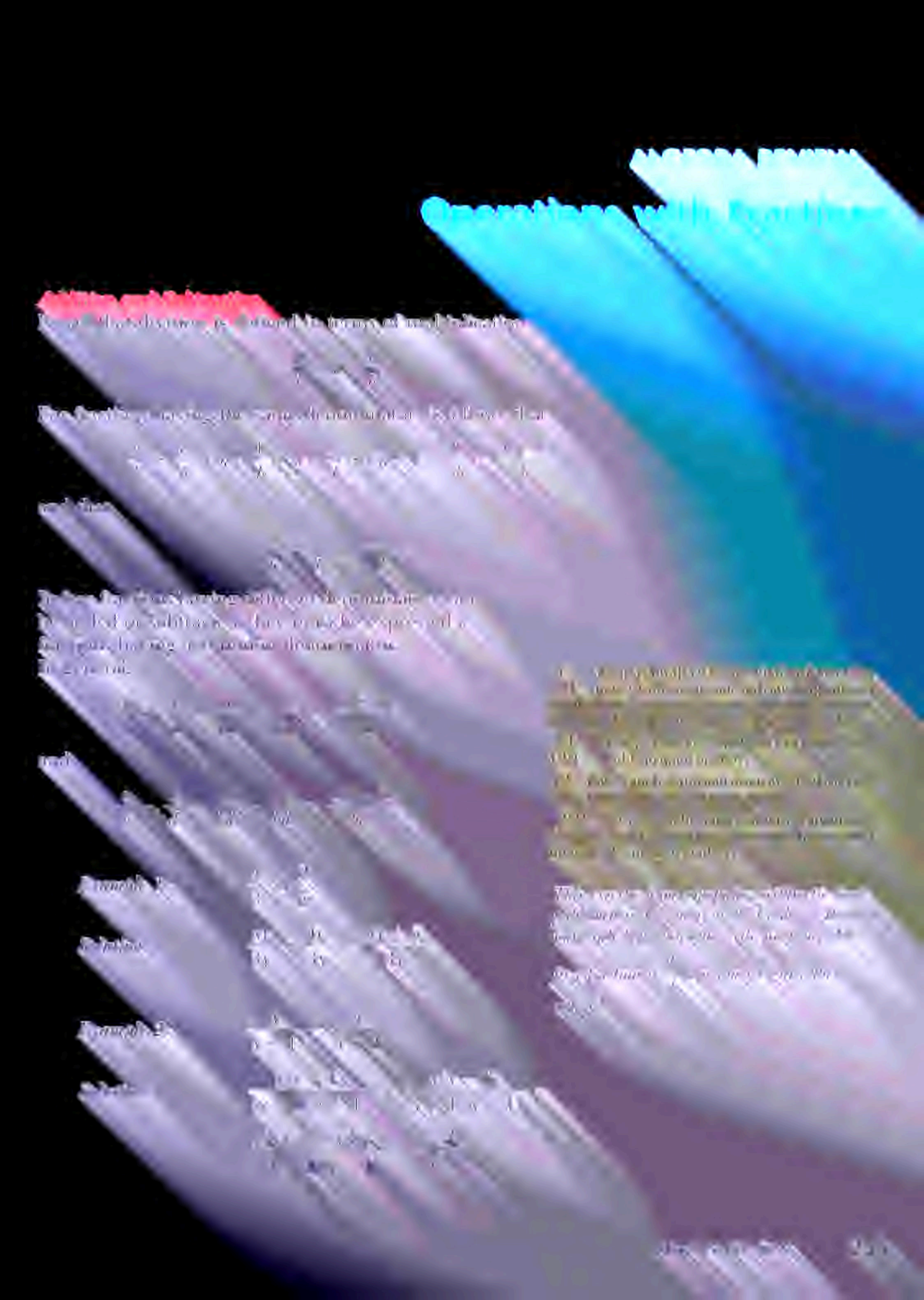
21. What do all of the triangular pieces in all three figures have in common?

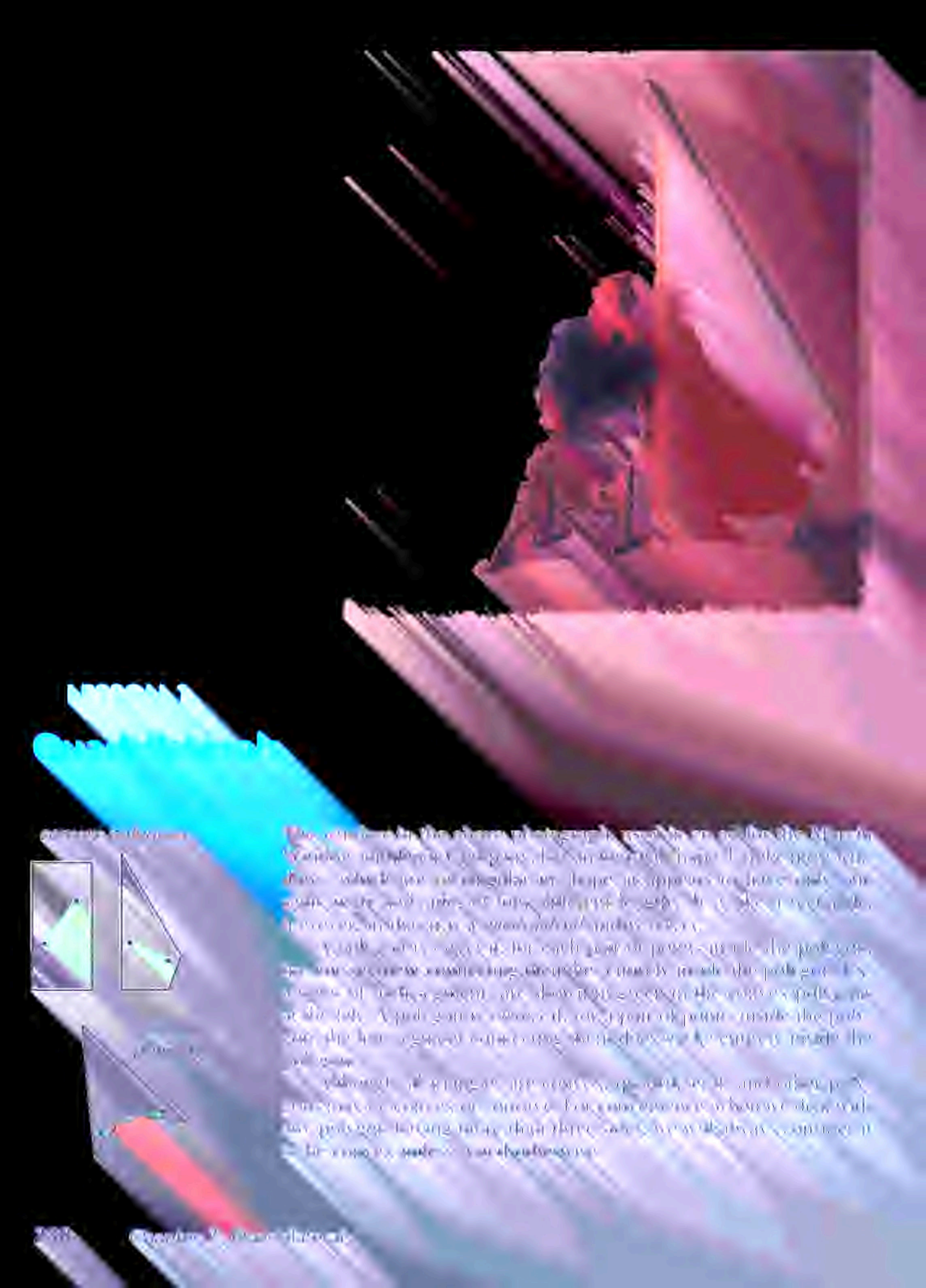
22. How many pieces of each figure are [illegible] triangles?

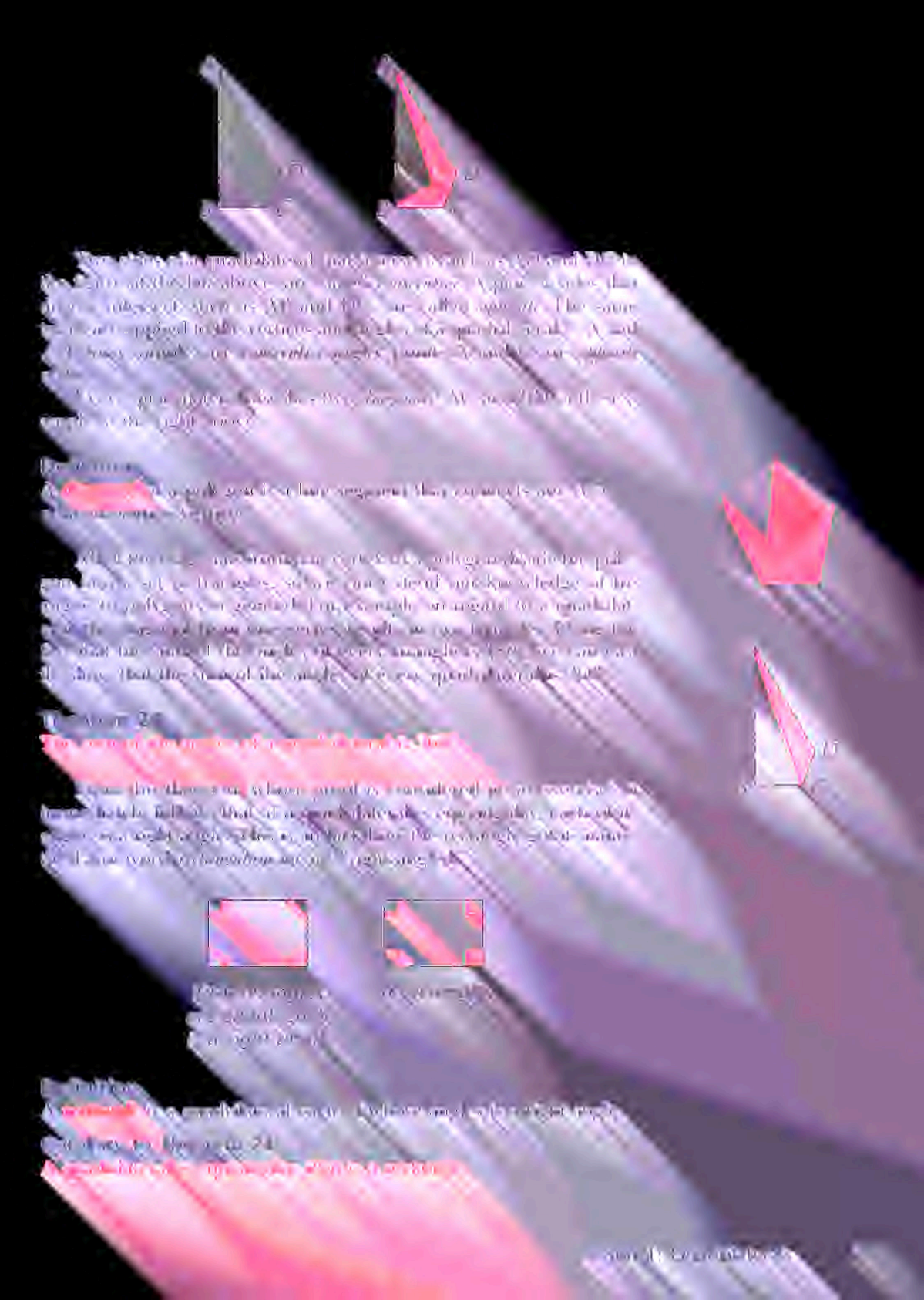
[illegible]



[illegible]

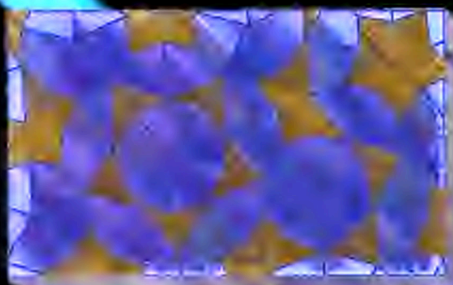








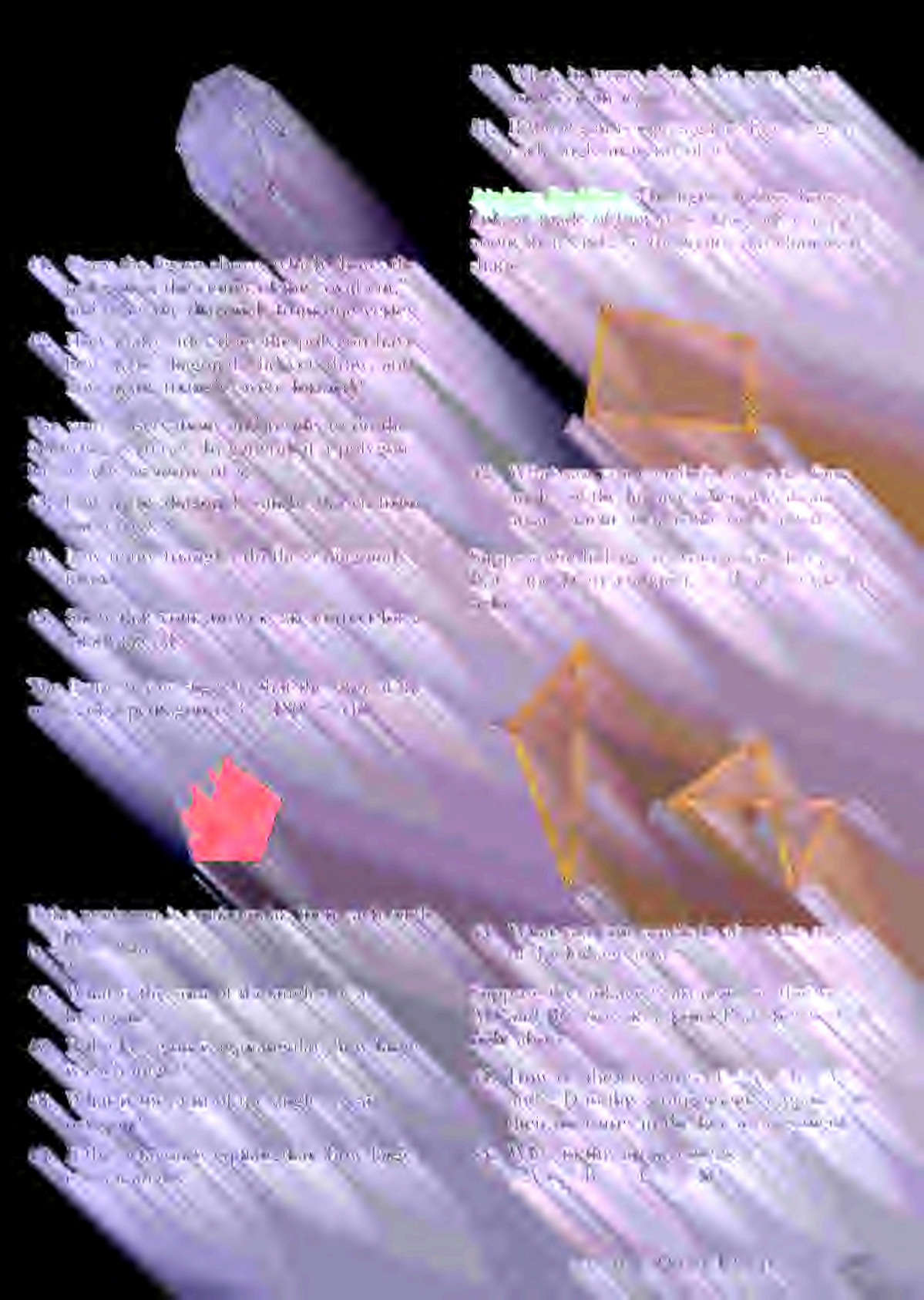


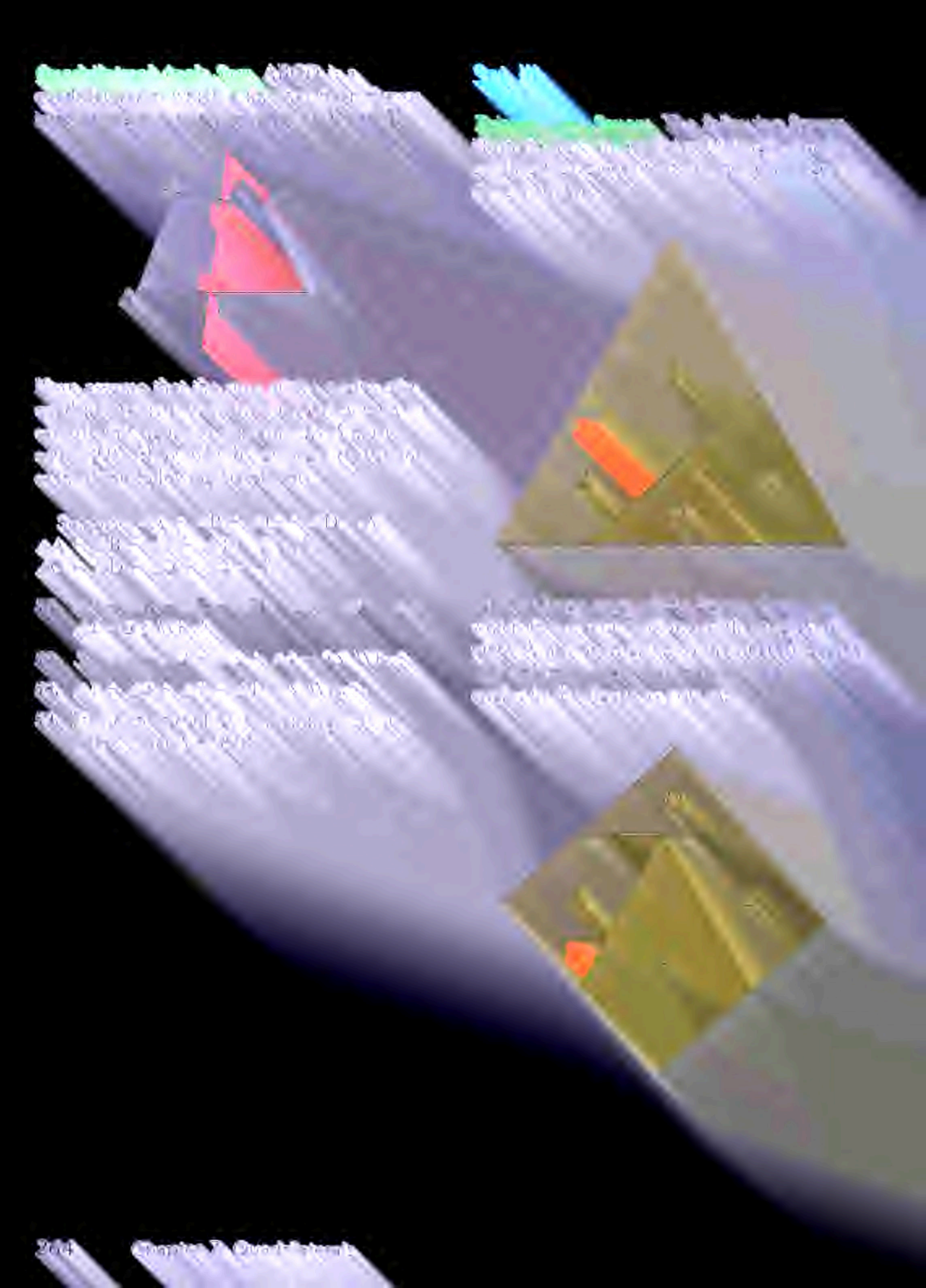
















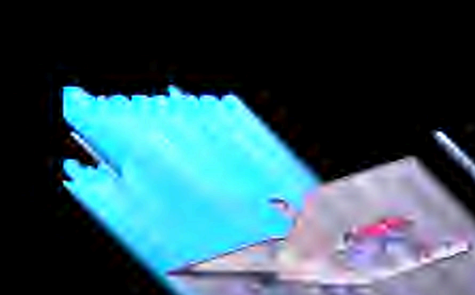


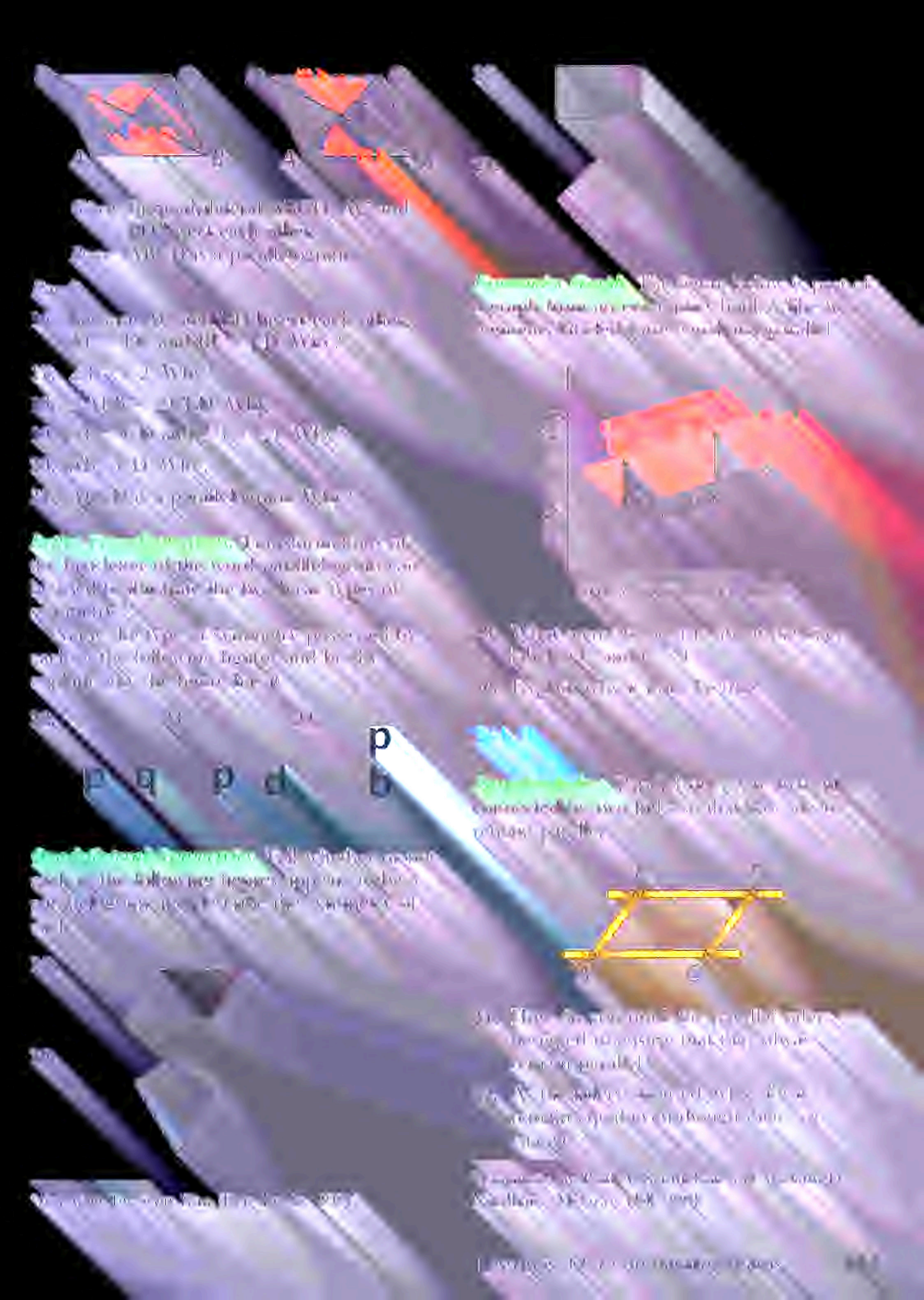




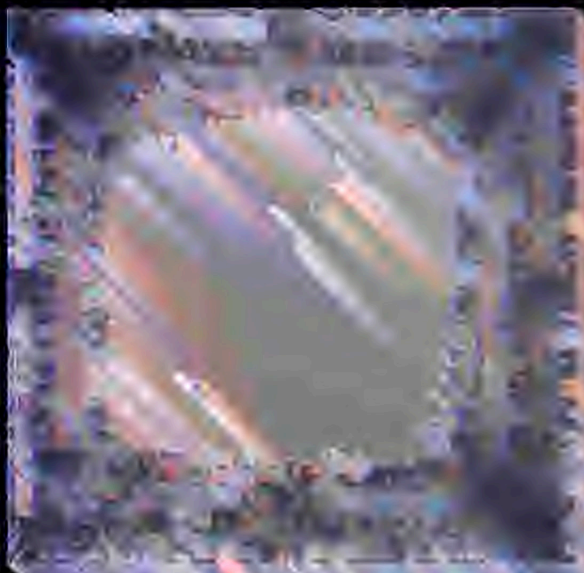












Rectangles, Rhombuses, and Squares











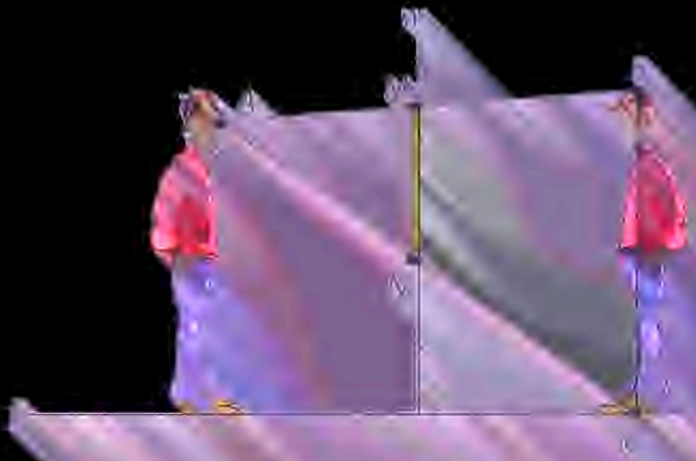












The Midsegment Theorem

[illegible]

[illegible]

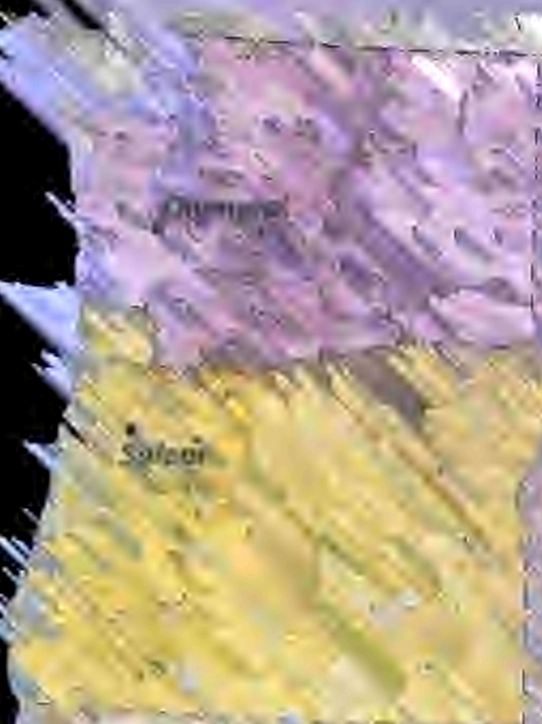
[illegible]

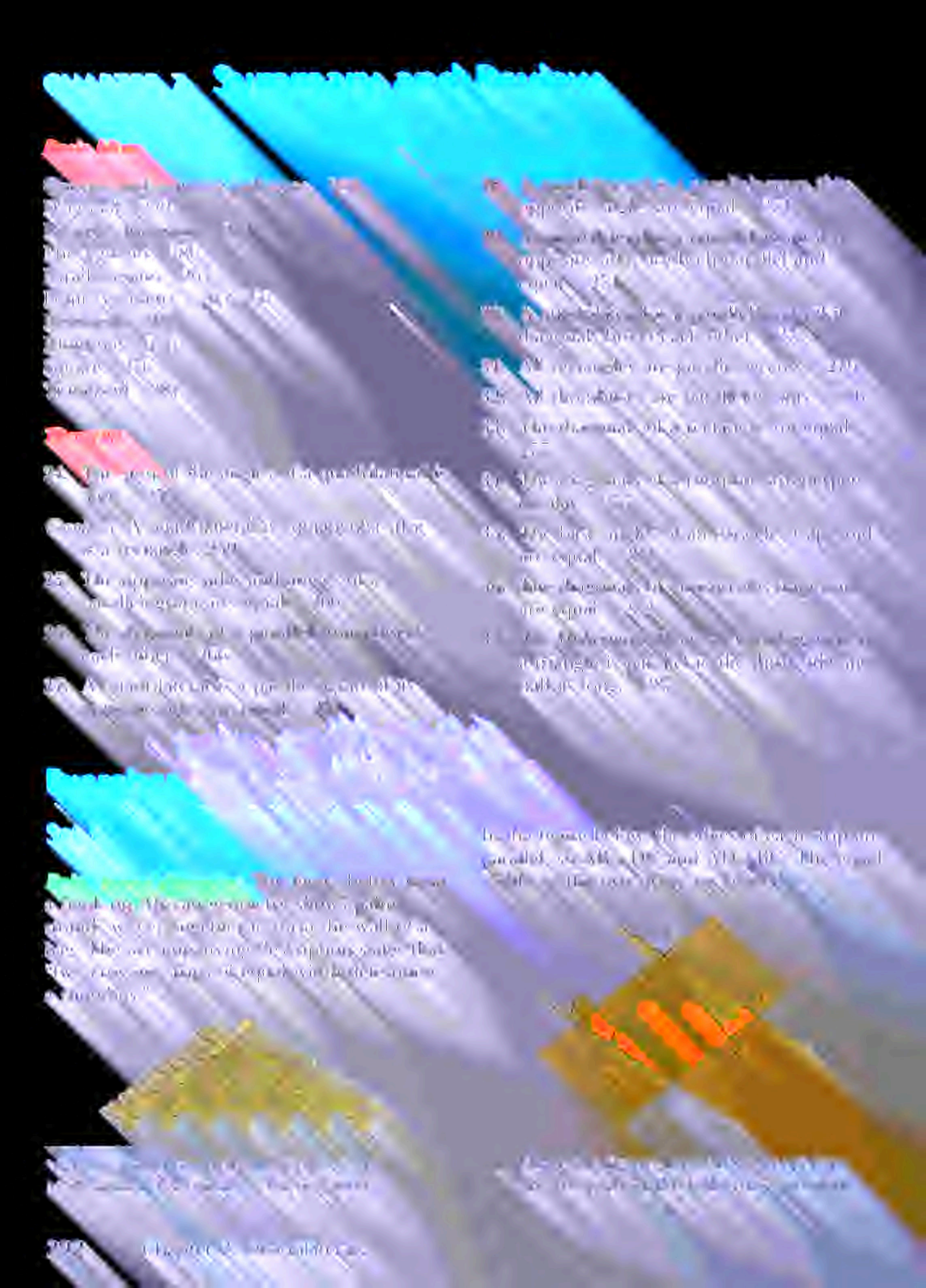
[illegible]

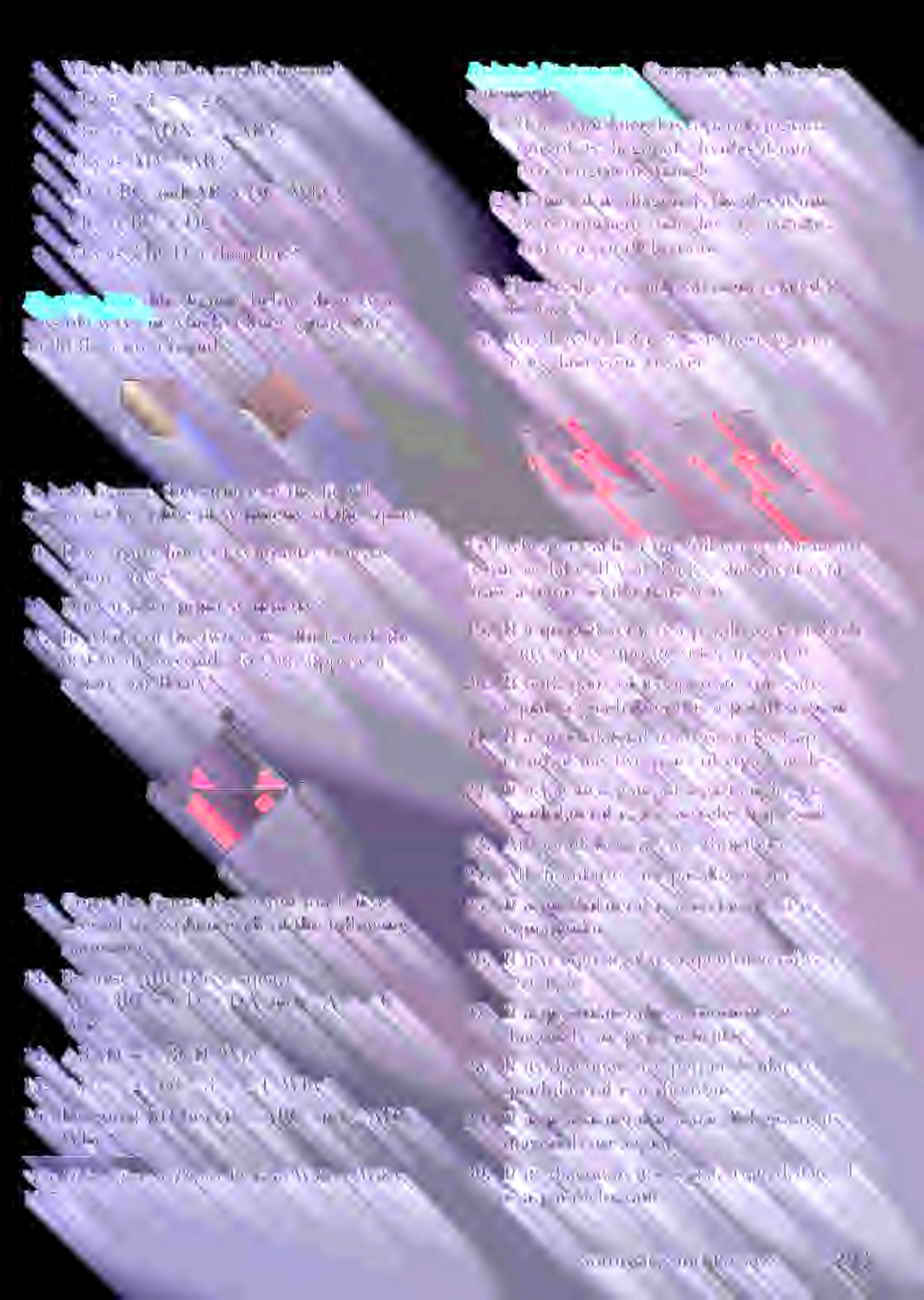
Definition

A *midsegment* of a triangle is a line segment that connects the [illegible] of two sides.

We can use the definition and we know how to [illegible] the following theorem.


Olympia
Salem
Boise

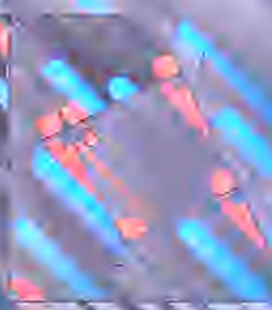












Space Rocks

The Space Rock of the Production Number

[illegible]

Stock Exchange

[illegible]

Space Rock Production

[illegible]

Space Rock Production

[illegible]

Space Rock Production













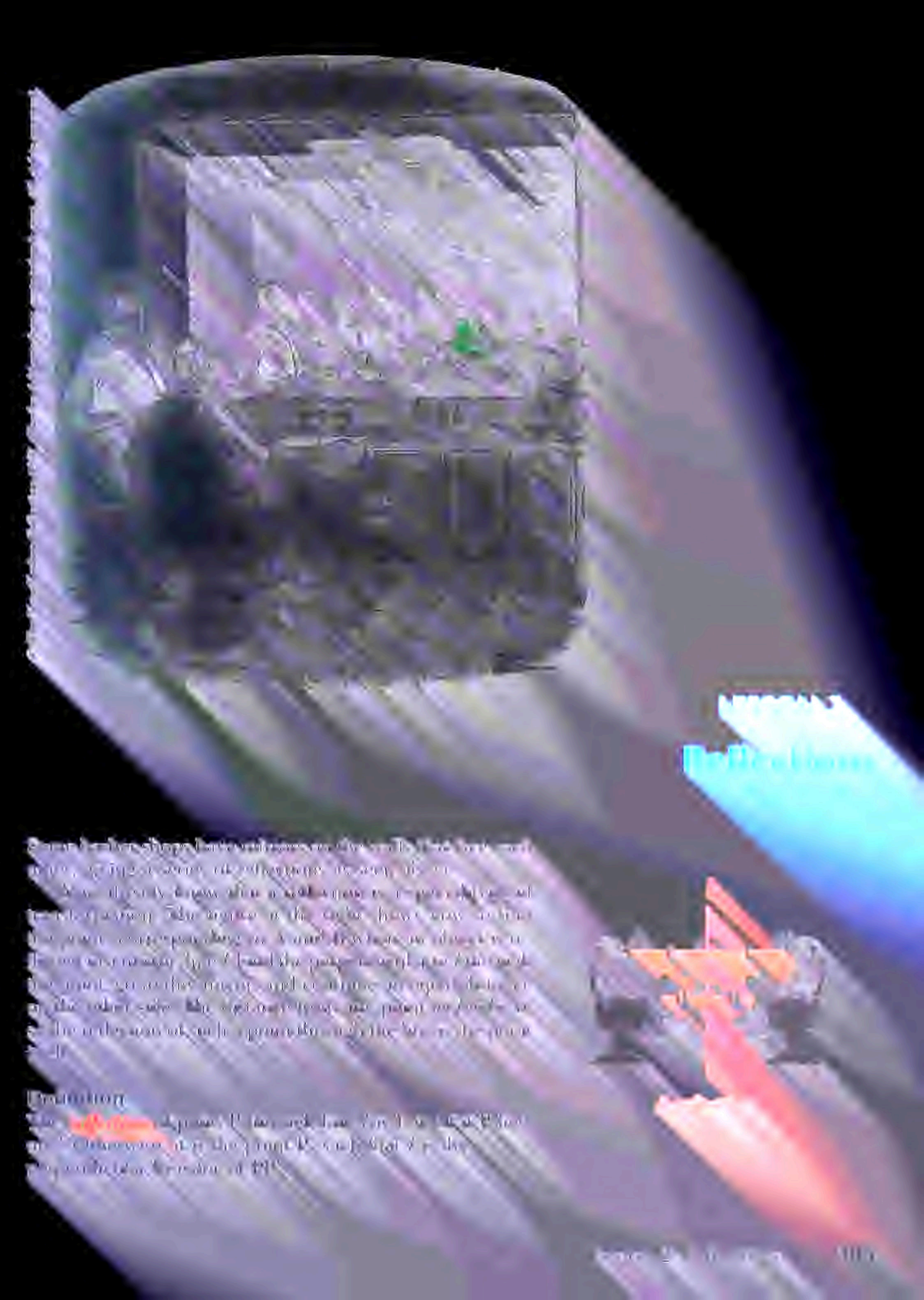






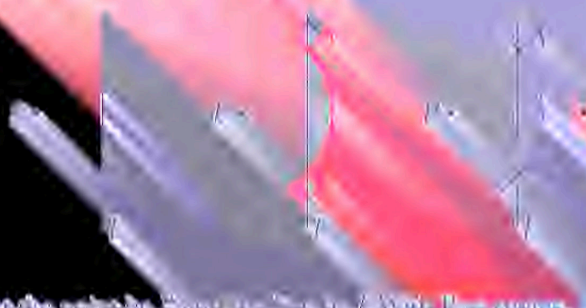




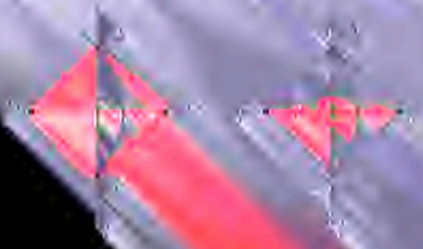


The reflection of a point through a line can be found by using a [illegible]

Construction 8:
Reflection of a point through a line



[illegible]



[illegible]

[illegible]





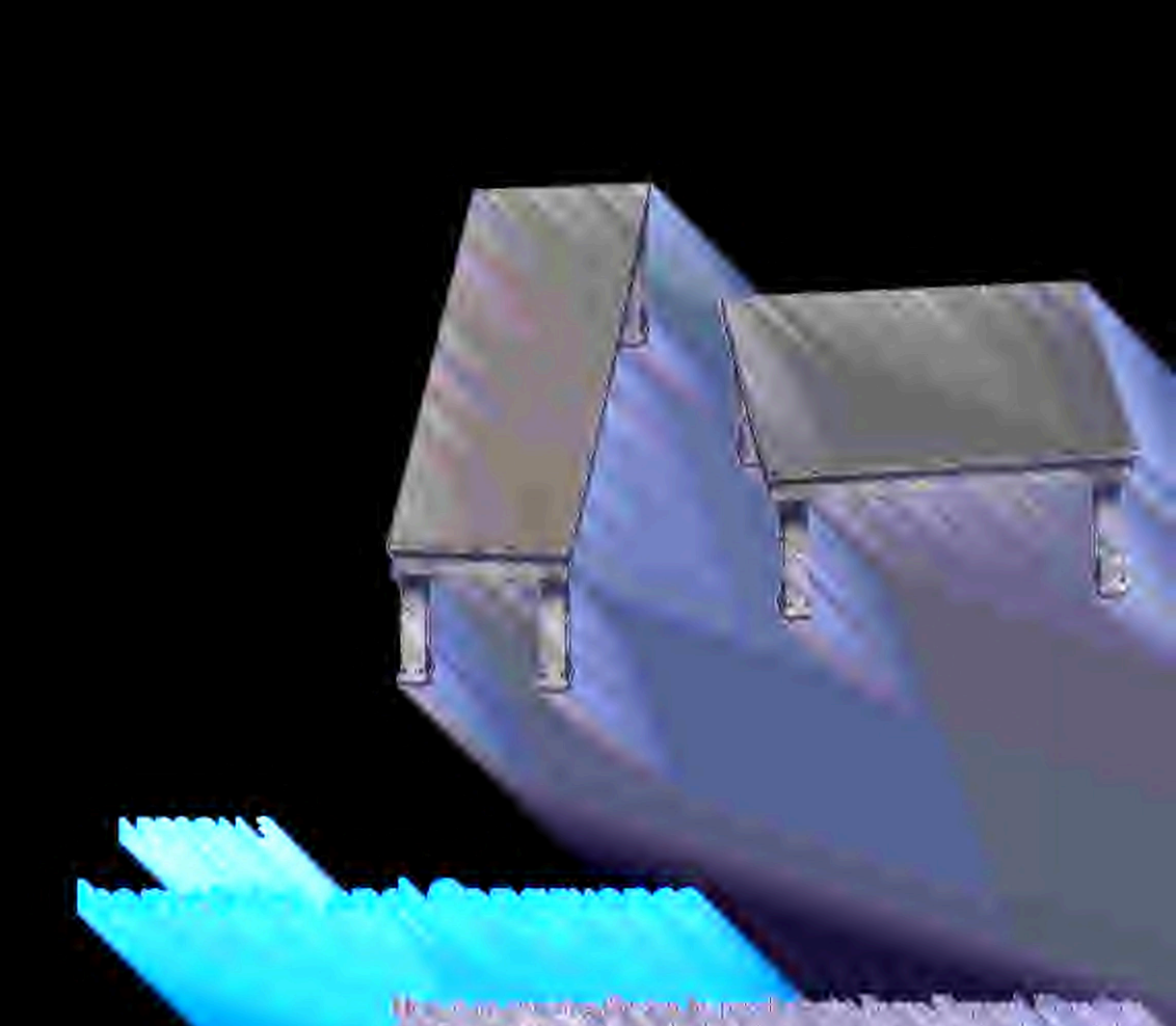






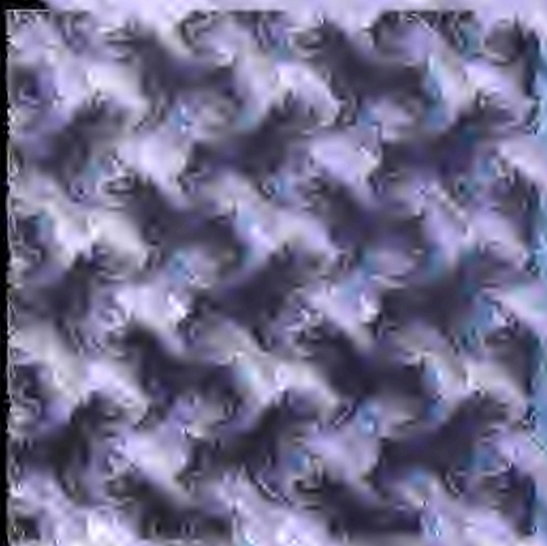

a

















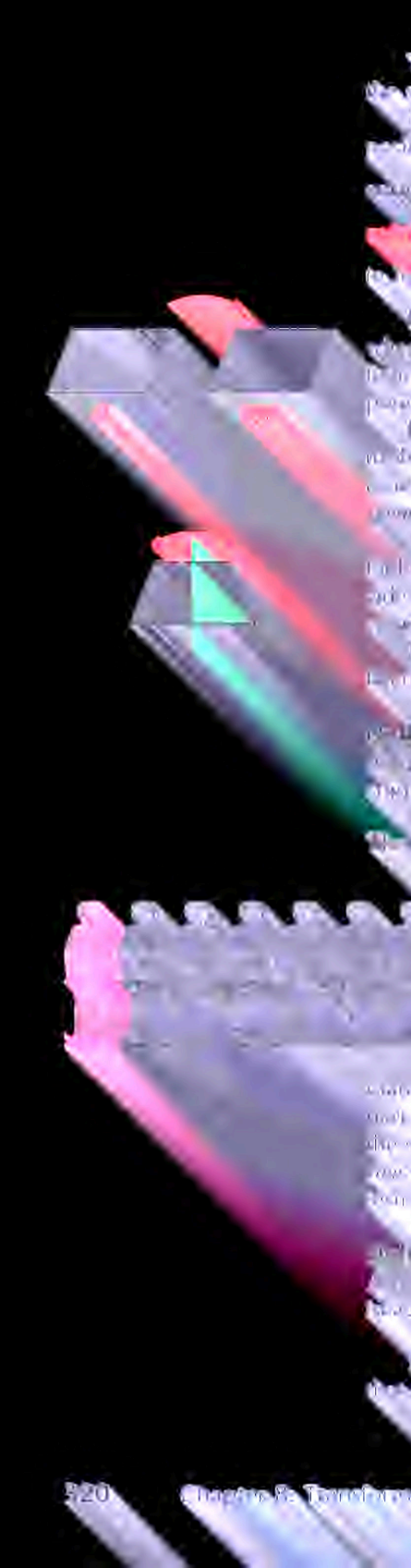




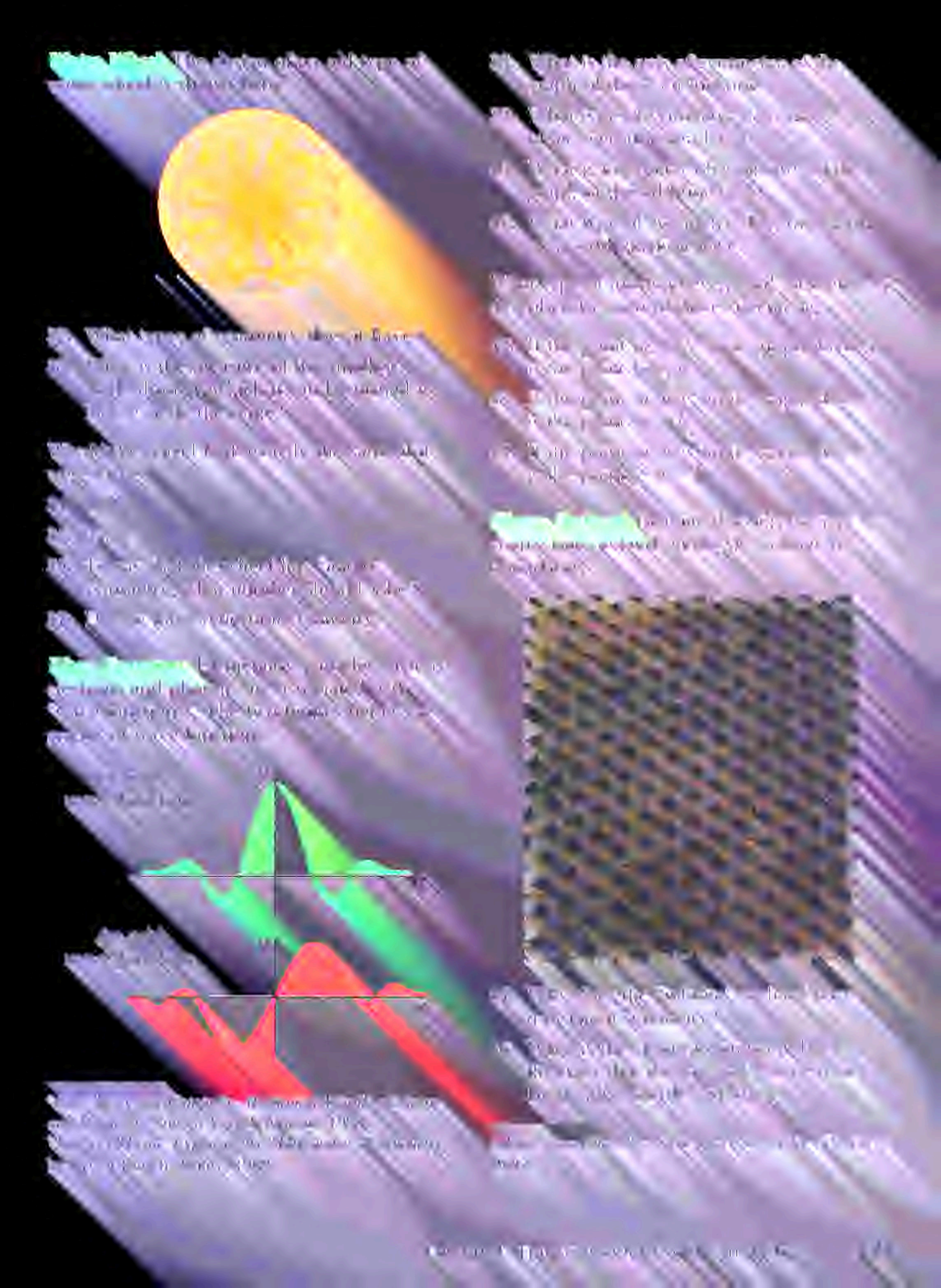


Transformations and Symmetry



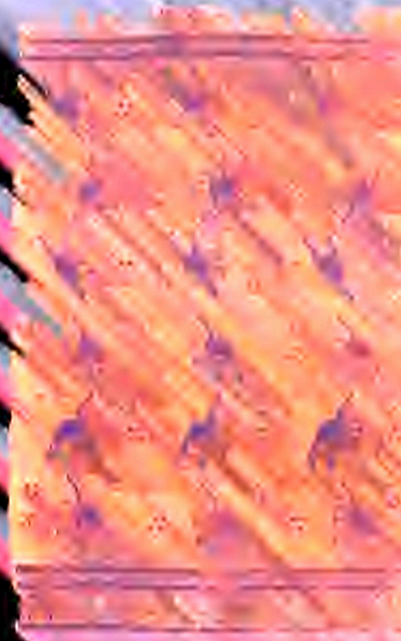






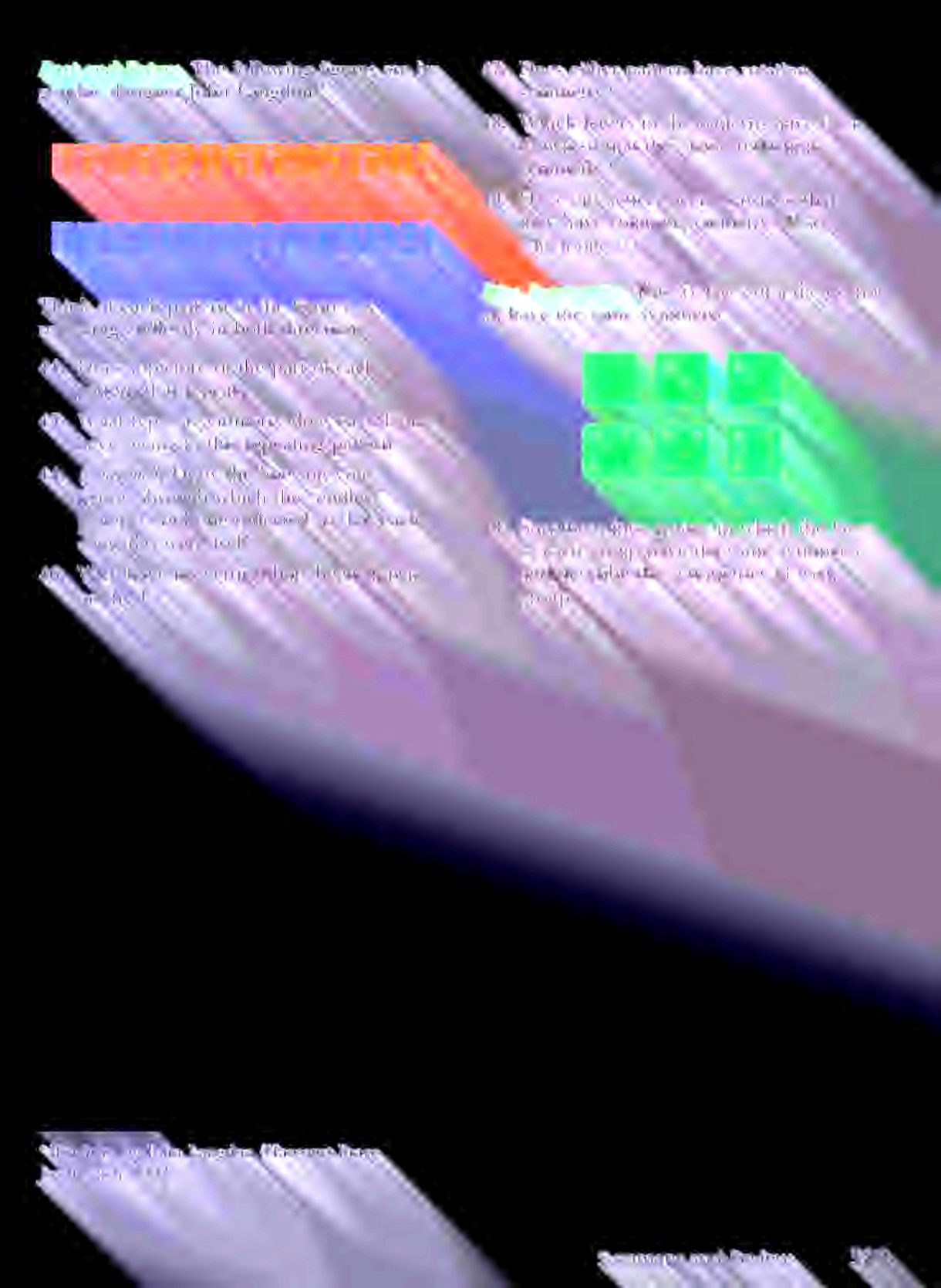


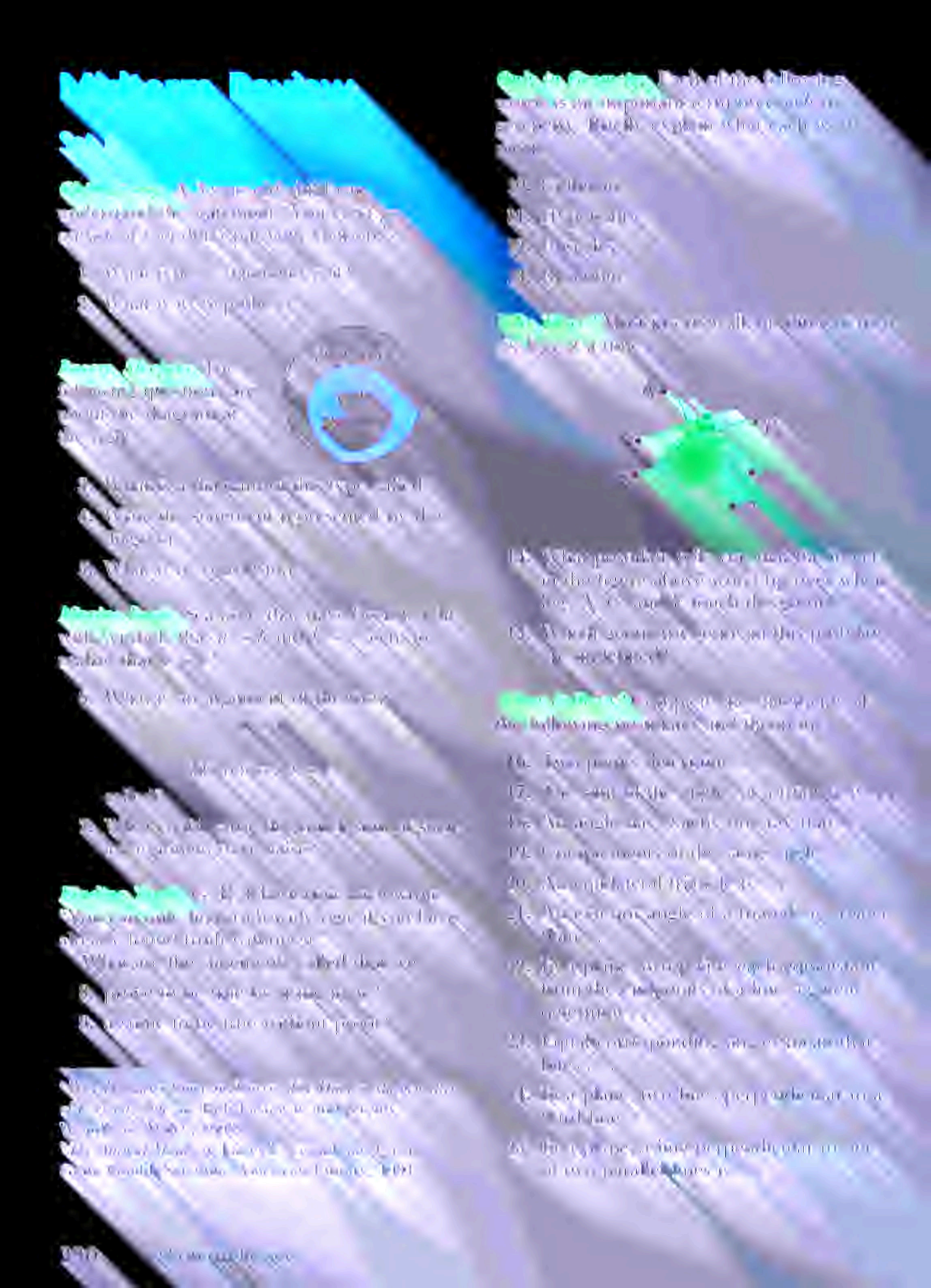




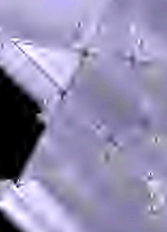




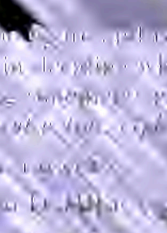




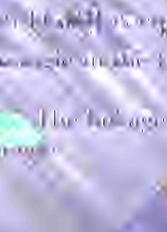
Exercise 1. The two angles in the polygon are the same. Find the value of x.



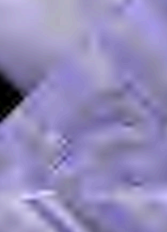
Exercise 2. Suppose that $\overline{AB}$ and $\overline{CD}$ are parallel. Find the value of x.



Exercise 3. Find the value of x.



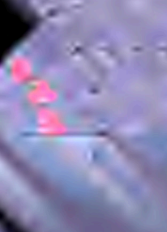
Exercise 4. Find the value of x.



Exercise 5. Find the value of x.



Exercise 6. Find the value of x.



Exercise 7. Find the value of x.



Exercise 8. Find the value of x.



Exercise 9. Find the value of x.

Exercise 10. Find the value of x.

Exercise 11. Find the value of x.

Exercise 12. Find the value of x.

Exercise 13. Find the value of x.

Exercise 14. Find the value of x.

Exercise 15. Find the value of x.

Exercise 16. Find the value of x.

Exercise 17. Find the value of x.

Exercise 18. Find the value of x.

Exercise 19. Find the value of x.

Exercise 20. Find the value of x.

Exercise 21. Find the value of x.

Exercise 22. Find the value of x.

Exercise 23. Find the value of x.

Exercise 24. Find the value of x.

Exercise 25. Find the value of x.

Exercise 26. Find the value of x.

Exercise 27. Find the value of x.

Exercise 28. Find the value of x.

Exercise 29. Find the value of x.

Exercise 30. Find the value of x.





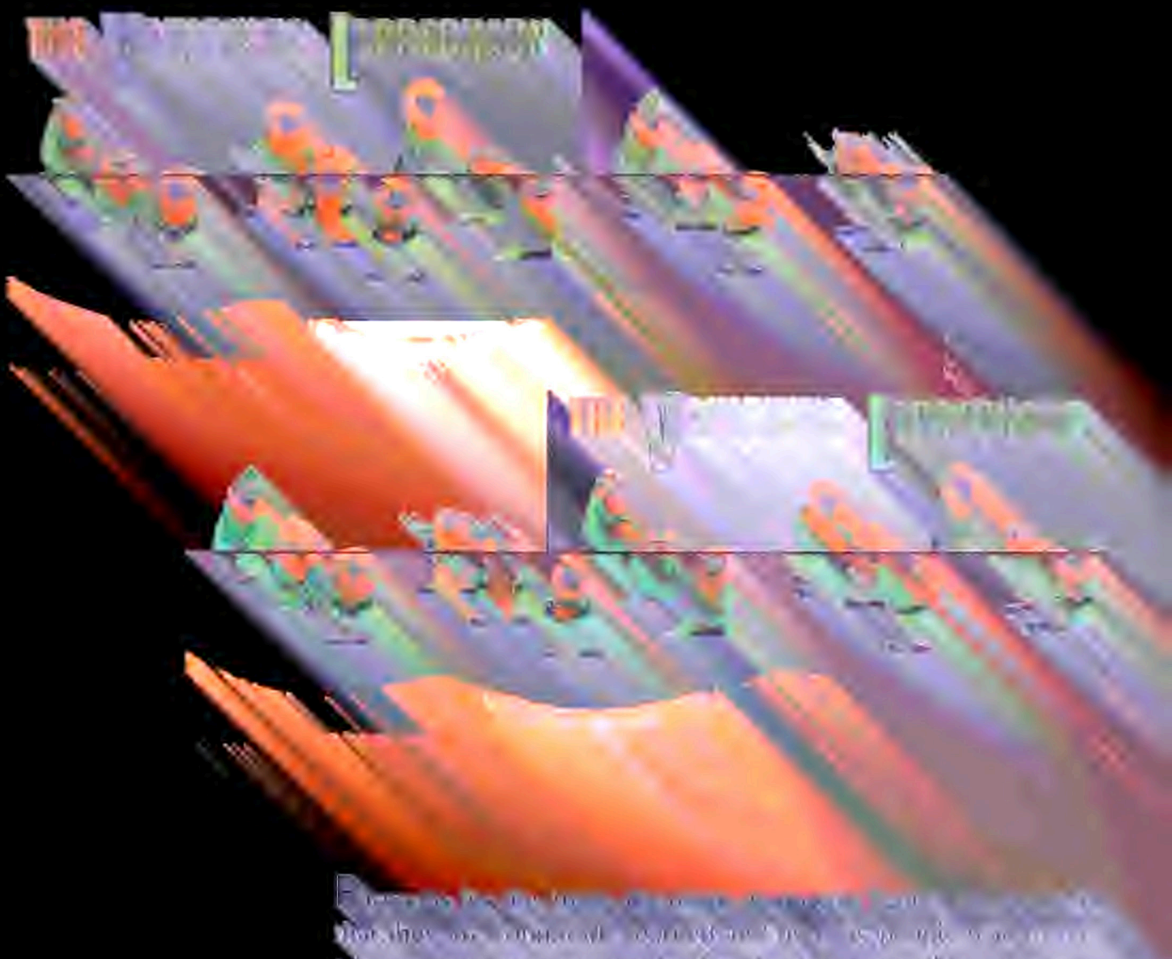












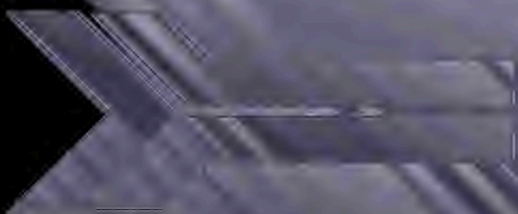
Exercises

Set 1

Problem 1. The Amtrak symbol shows [illegible]



1. Consider a rotation of the figure below [illegible]



2. What type of parallelogram [illegible]
3. What [illegible] the Amtrak [illegible]

Construction. [illegible]



4. [illegible]
5. Which has the [illegible]
6. [illegible]

Area Relations. [illegible]



[illegible]

[illegible]

Area Relations. [illegible]



[illegible]

[illegible]

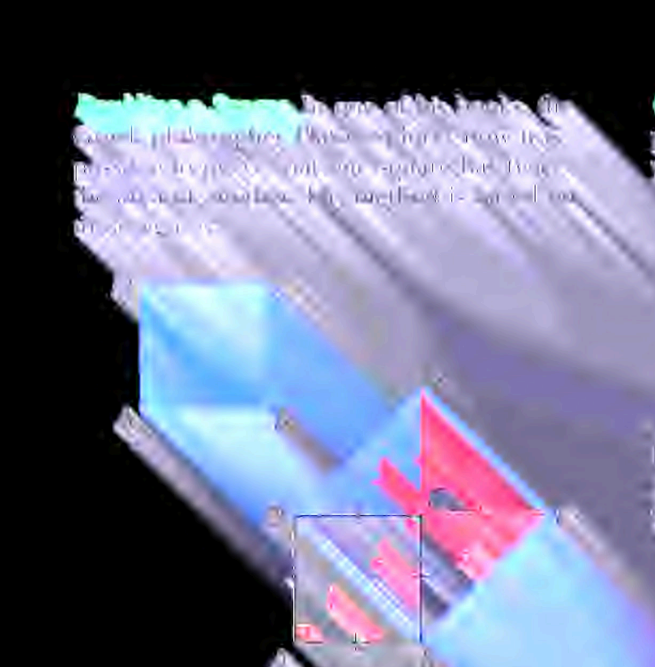
[illegible]

[illegible]

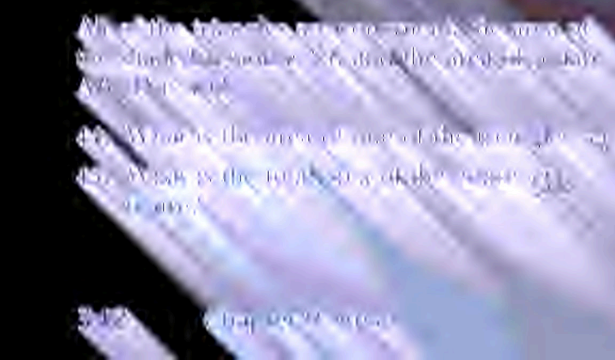


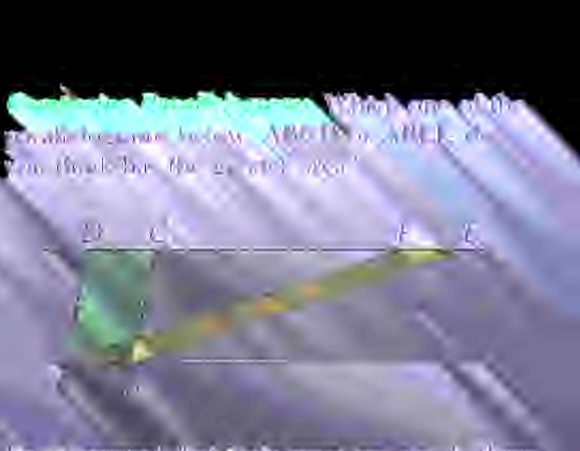


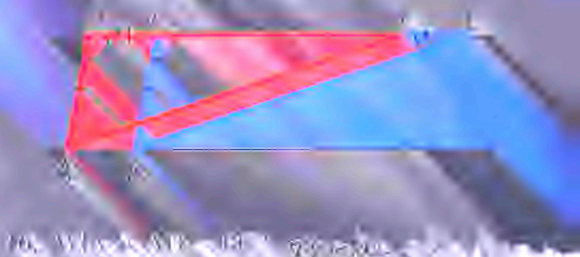

A
B
C

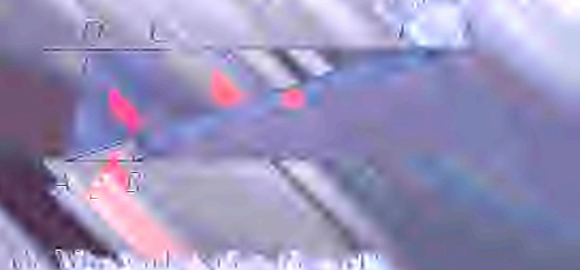






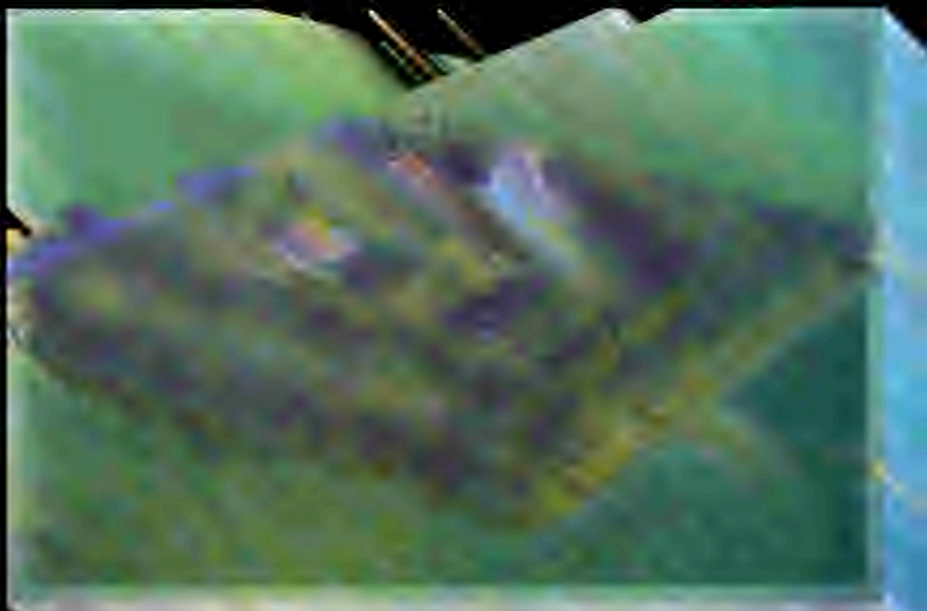


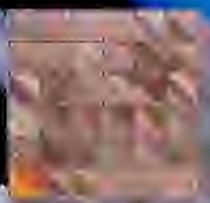


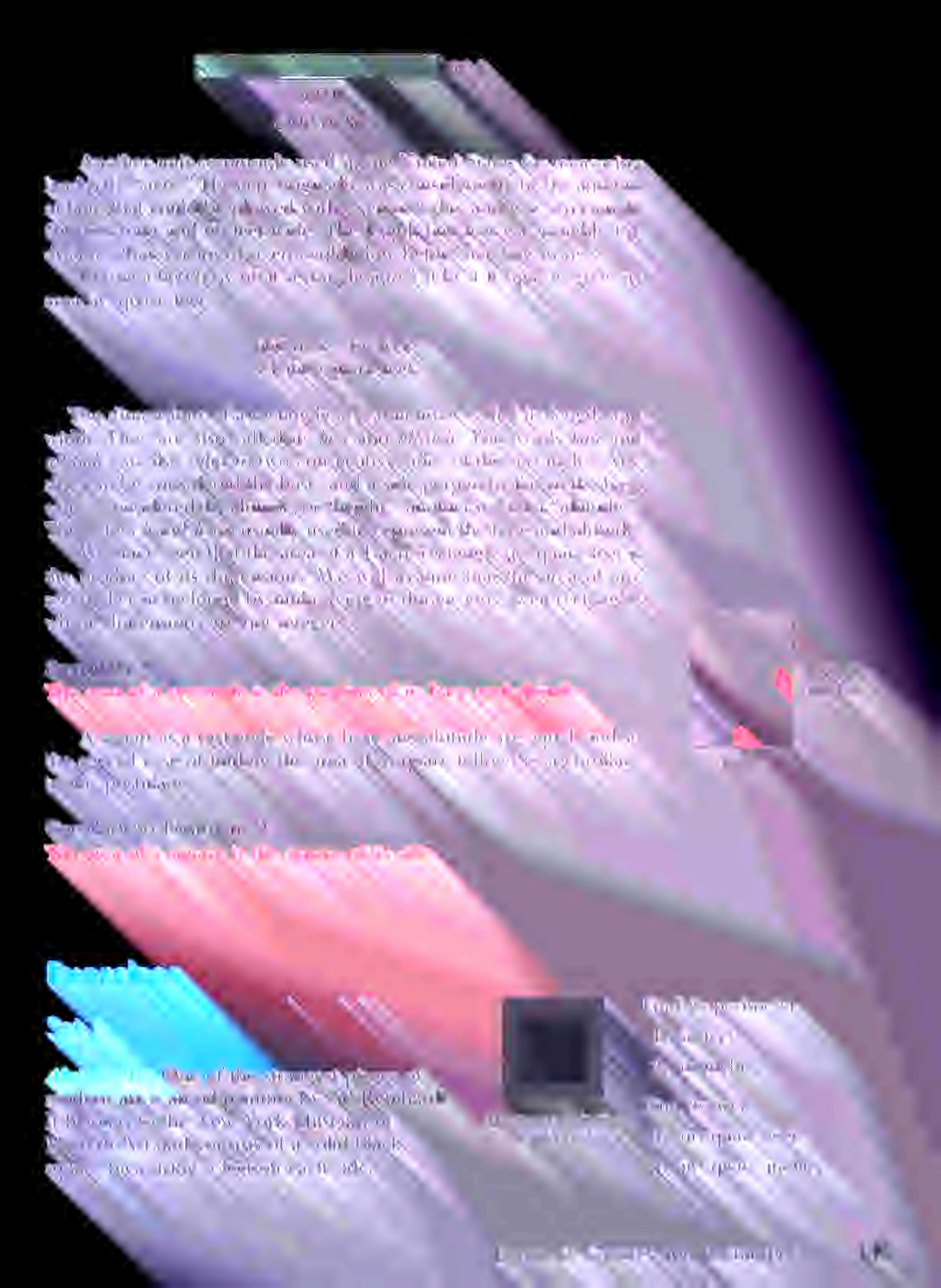




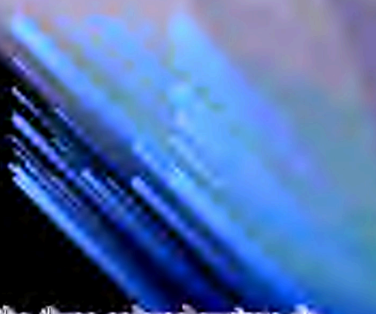








[illegible] [illegible]



5. Which of the three [illegible] [illegible]
6. Find the area of each region.

[illegible] [illegible]

[illegible] [illegible]



11. [illegible]
12. [illegible]
13. [illegible]

[illegible] [illegible]



14. [illegible]
15. [illegible]
16. [illegible]



[illegible] [illegible]

7. [illegible]
8. [illegible]
9. [illegible]
10. [illegible]

[illegible]



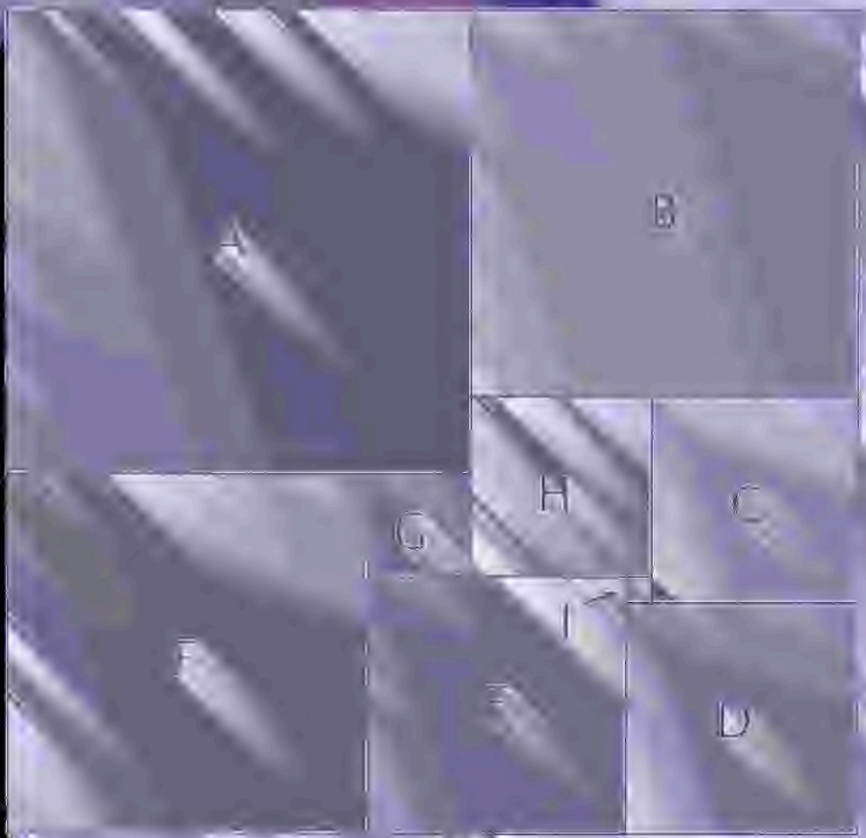


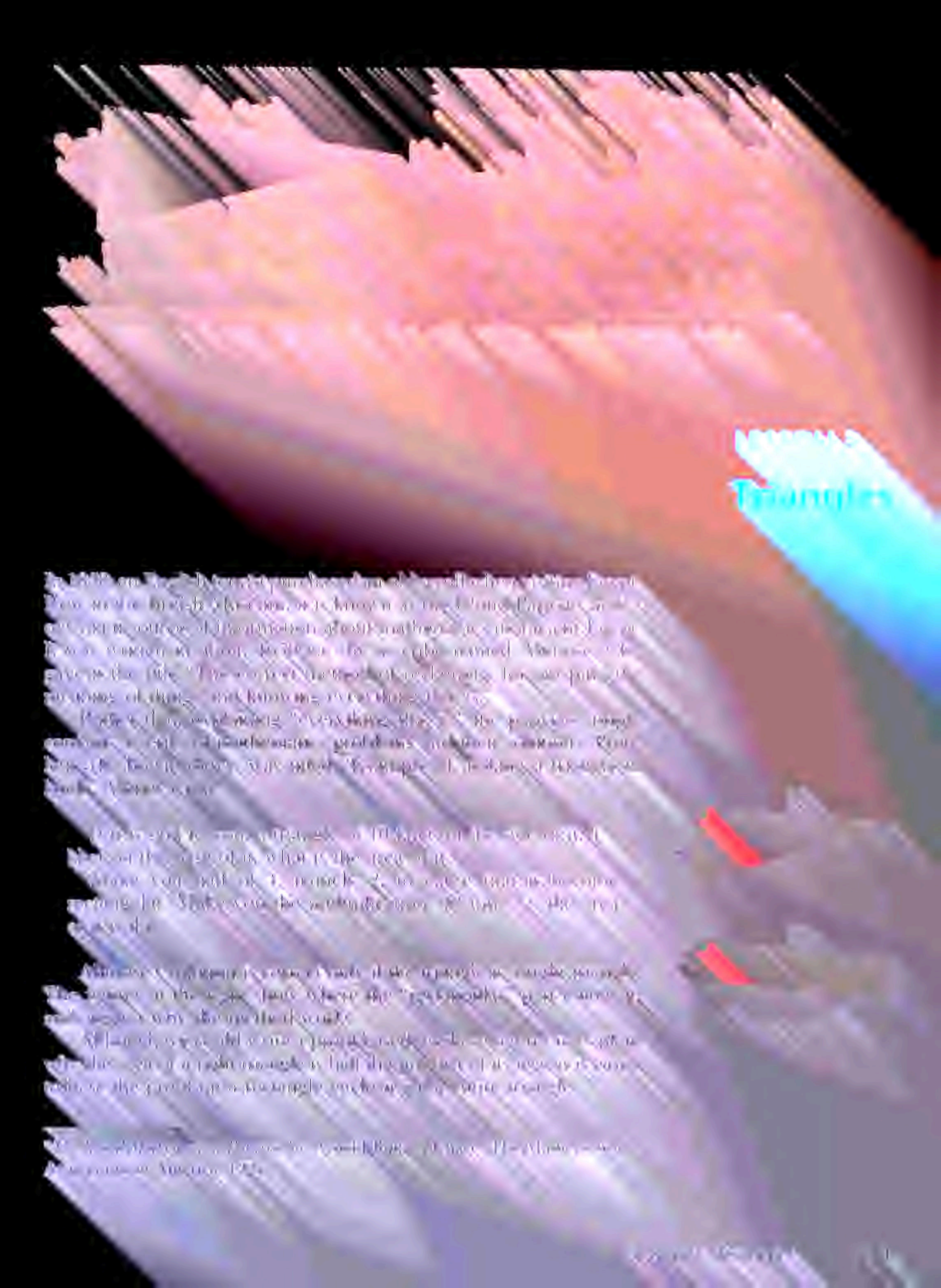
LOS ANGELES



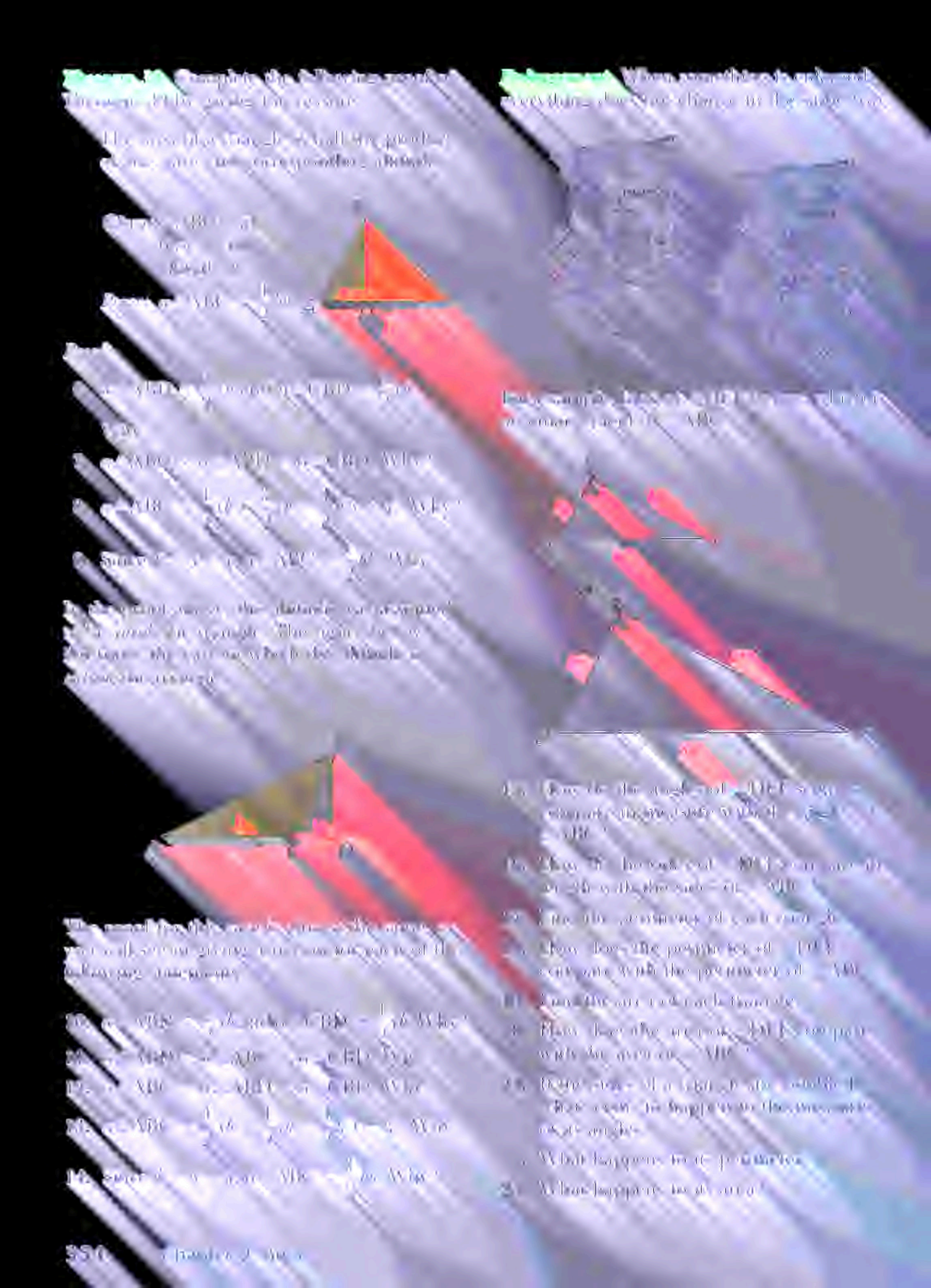





A
B
H
C
G
I
F
E
D









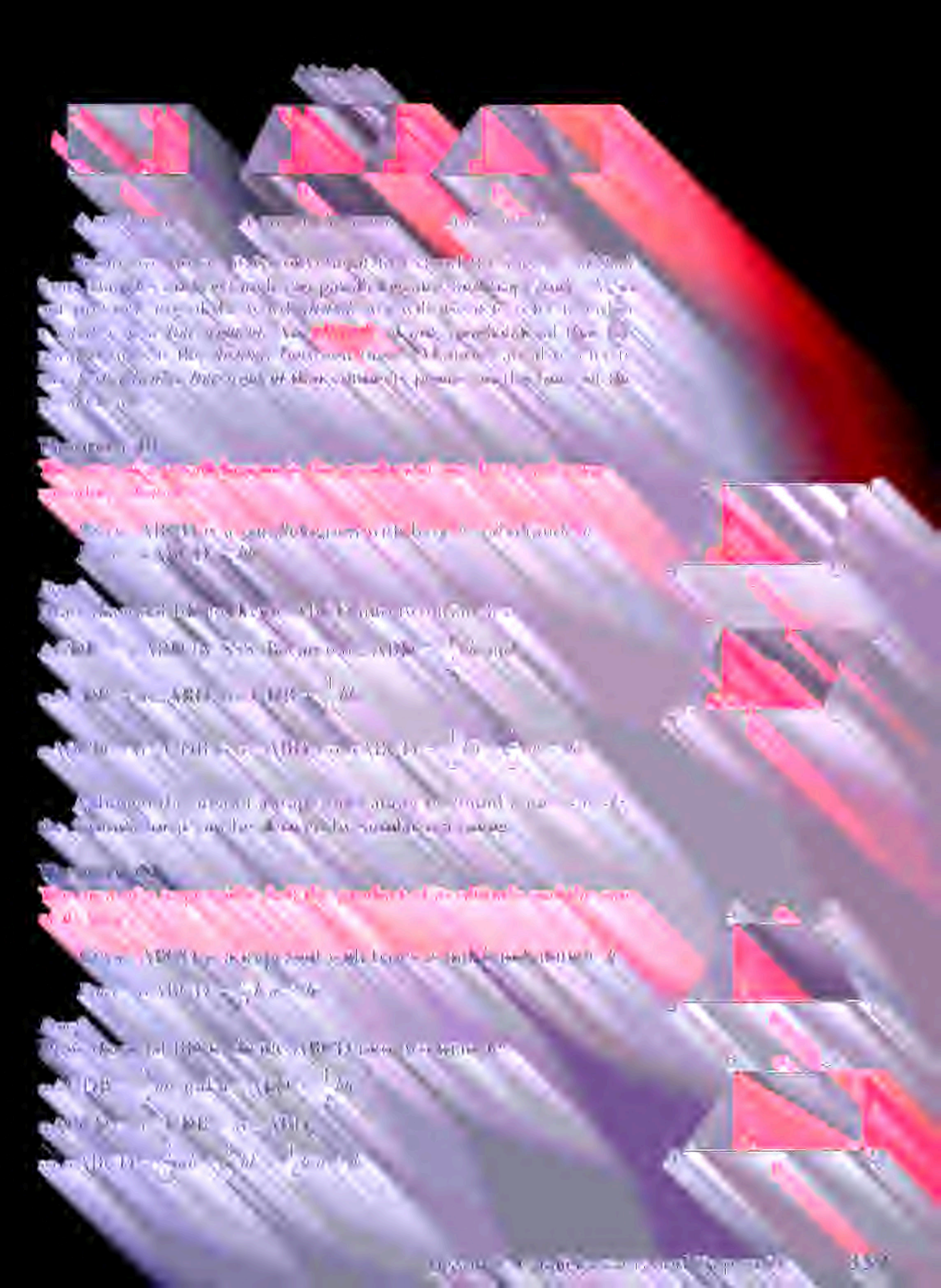












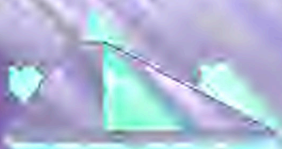


















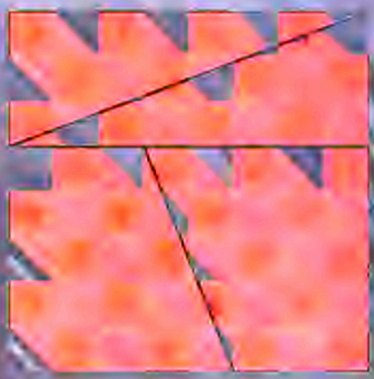


Example 1 The figure below represents a rectangular piece of paper. The paper was folded along the dashed line.



Part A

Which figure shows the paper after it was folded along the dashed line?



Part B

Which figure shows the paper after it was folded along the dashed line?

Part C

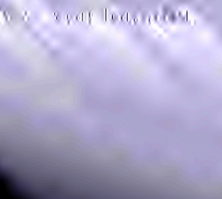
Which figure shows the paper after it was folded along the dashed line?

Part D

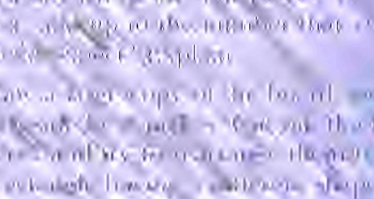
Which figure shows the paper after it was folded along the dashed line?

Example 2 Which of the following figures could be made by folding a square piece of paper?

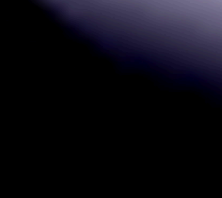
A.



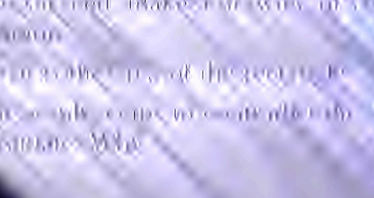
B.



C.

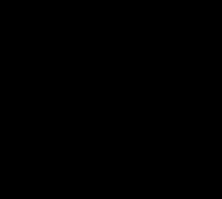


D.

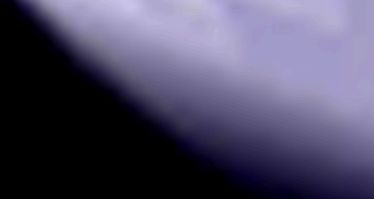


Example 3 Which of the following figures could be made by folding a square piece of paper?

A.



B.



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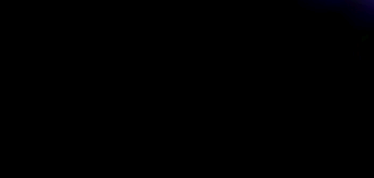








C
P



























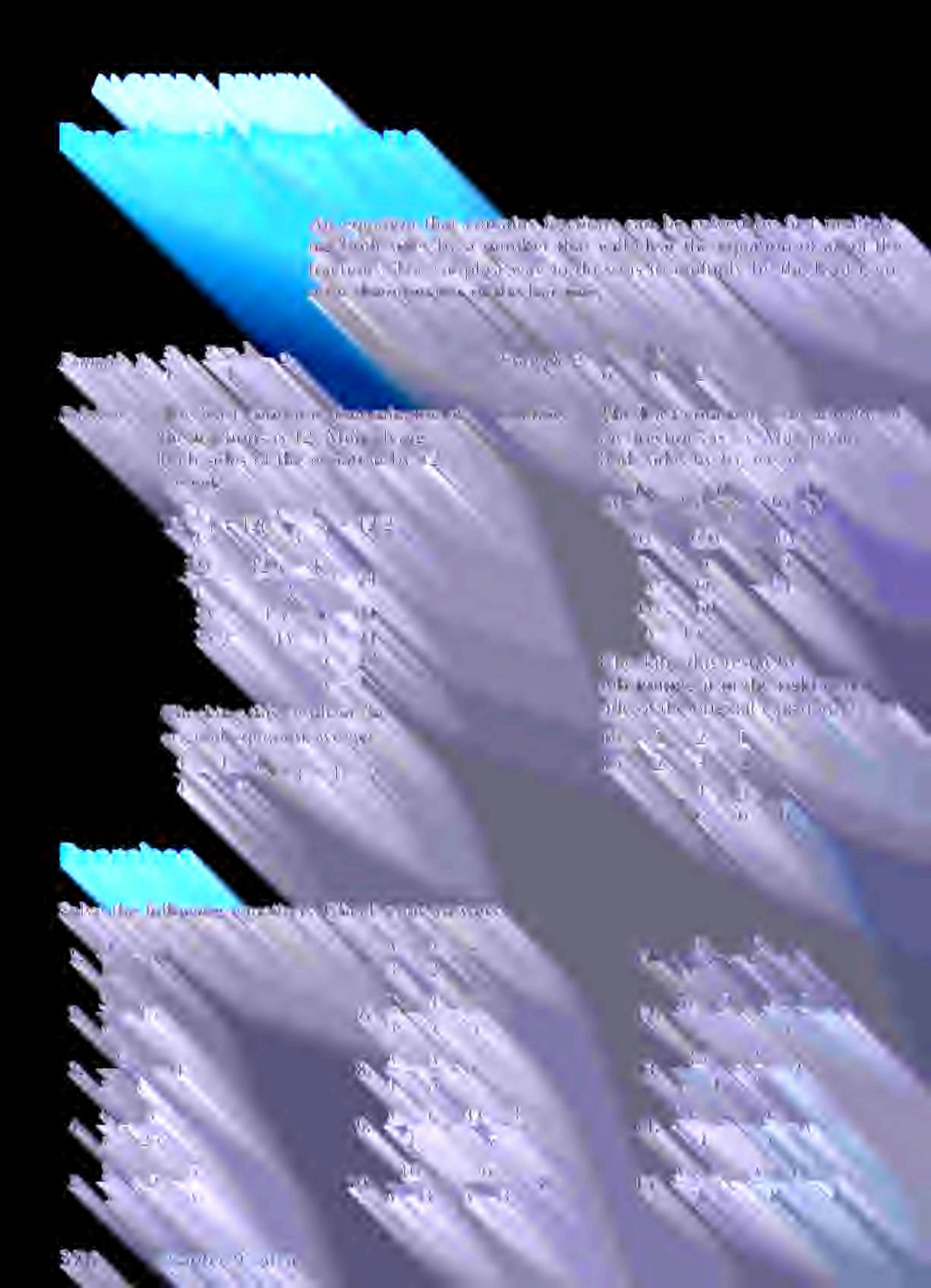







Ratio and Proportion

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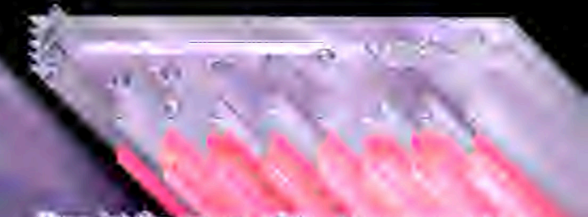

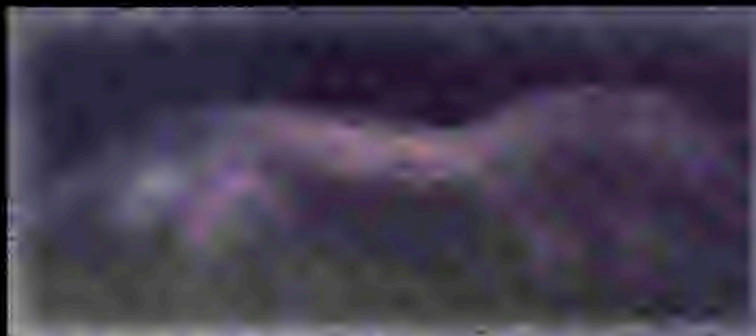



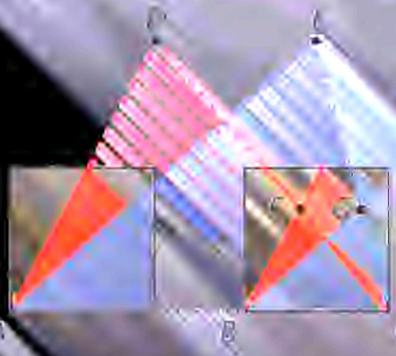















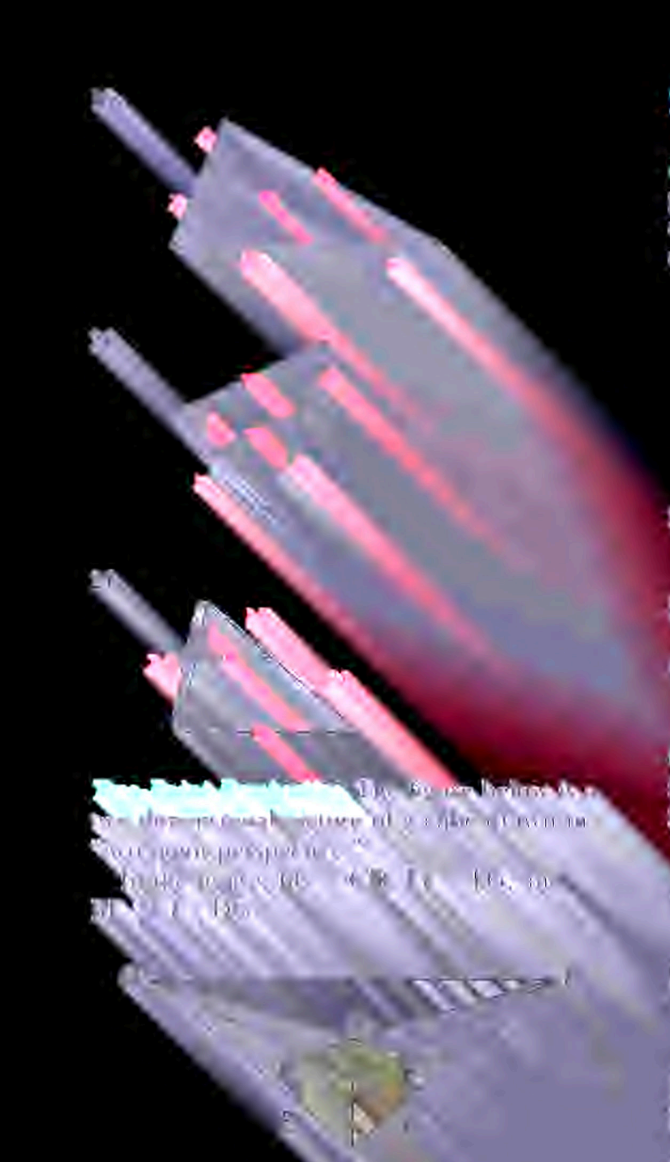

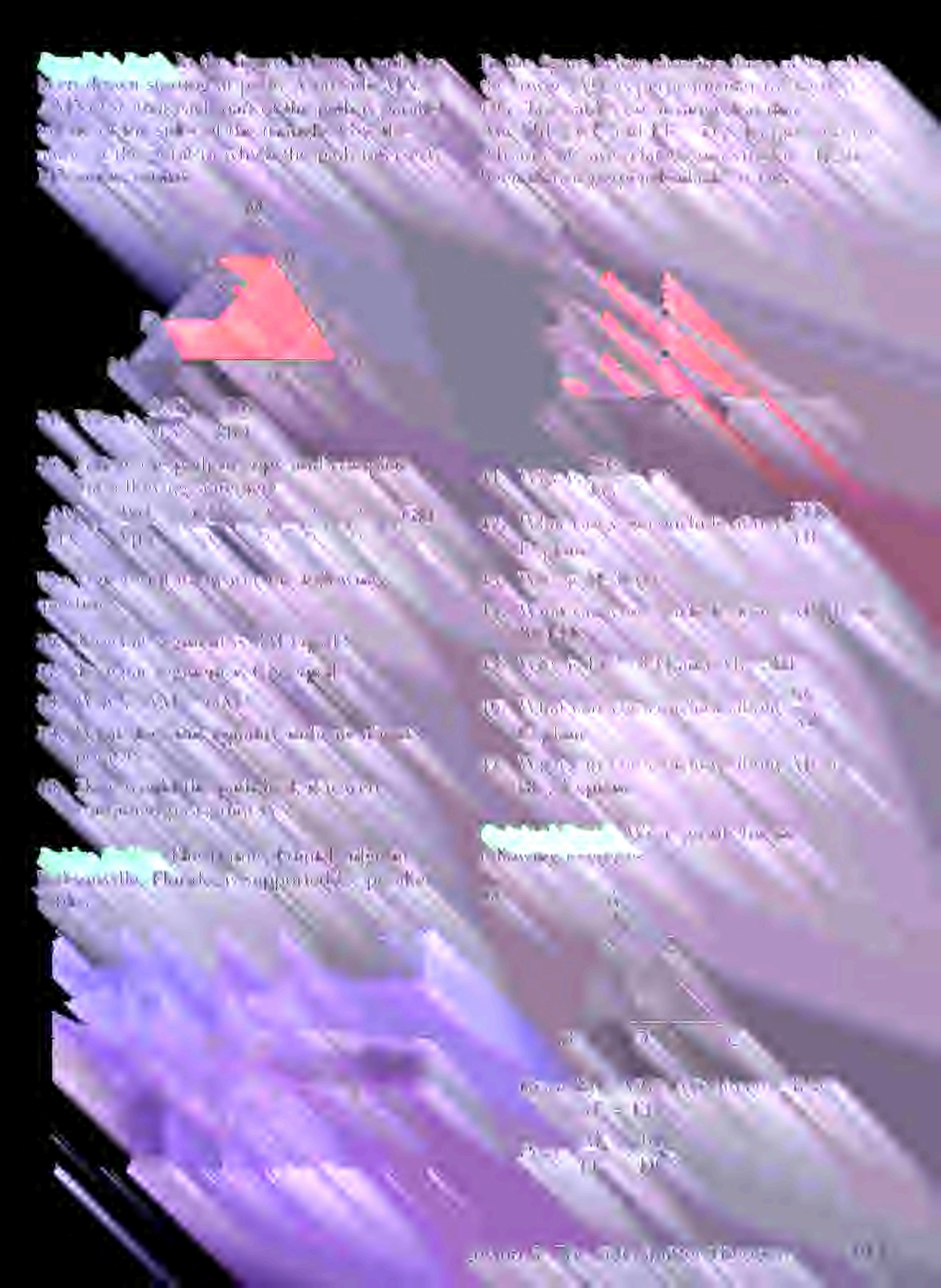











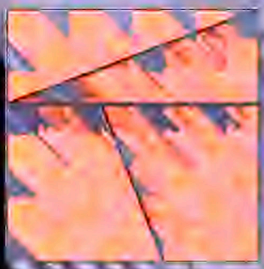

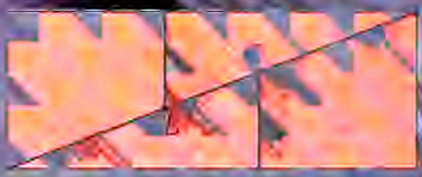





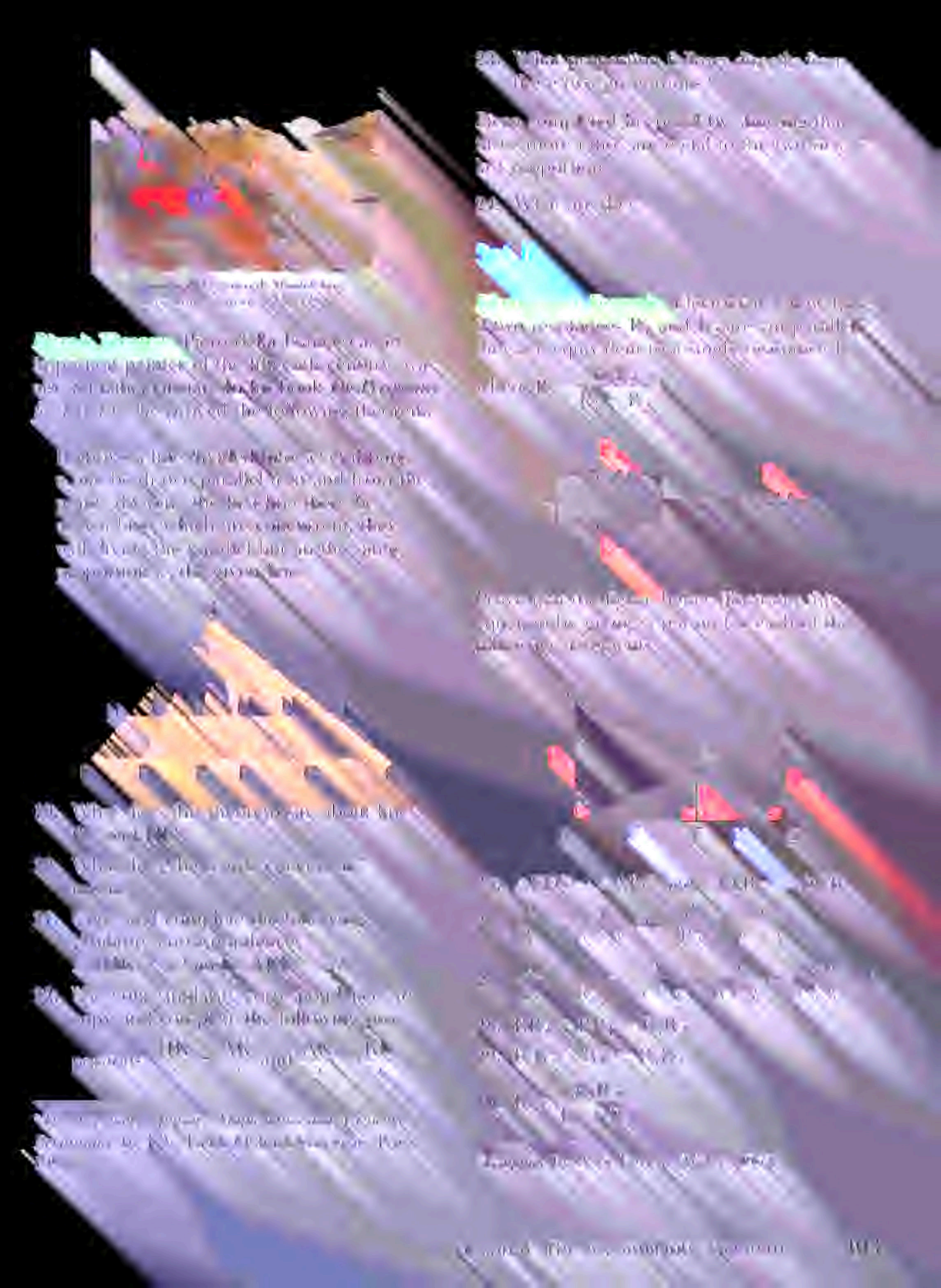











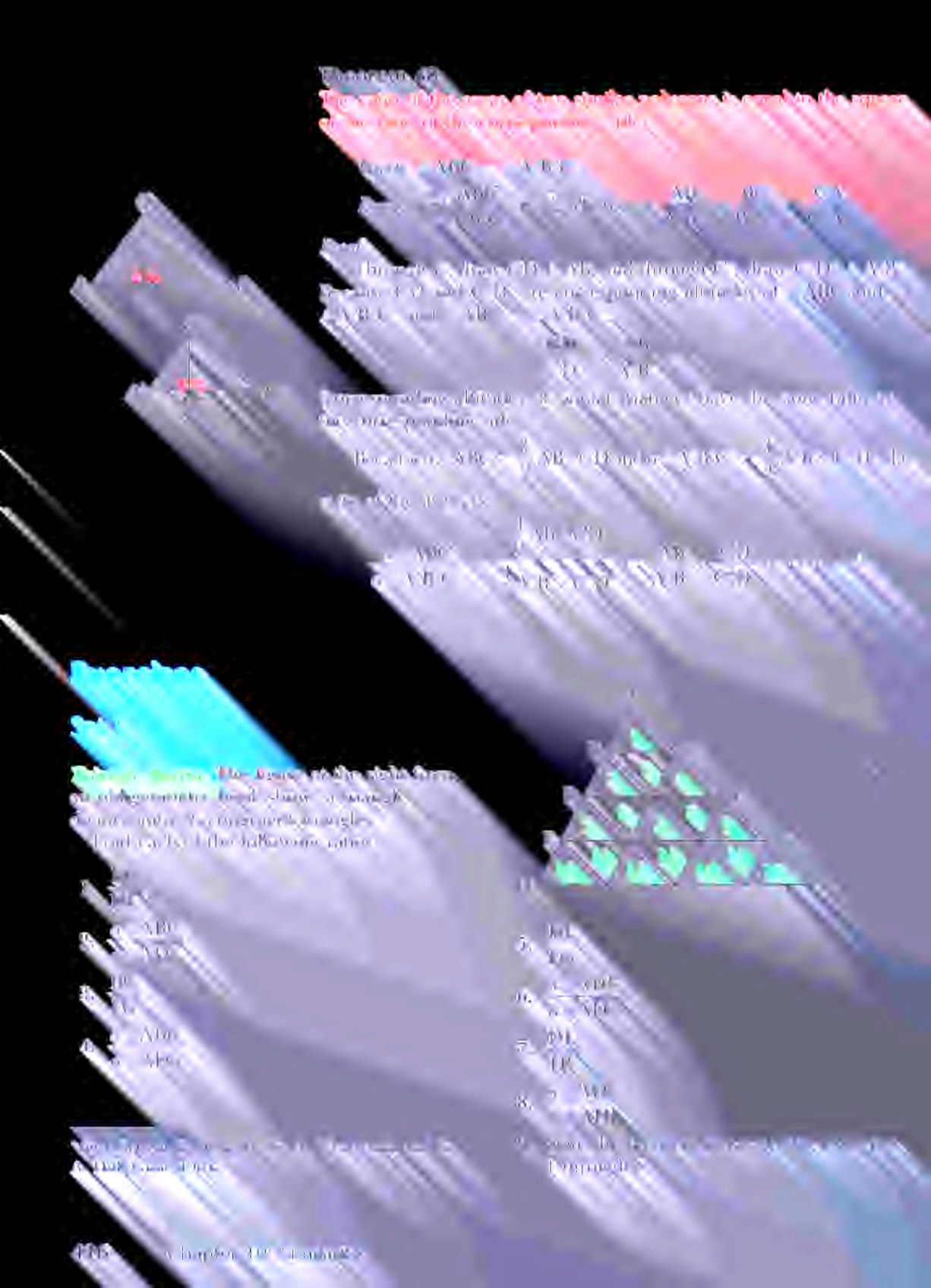

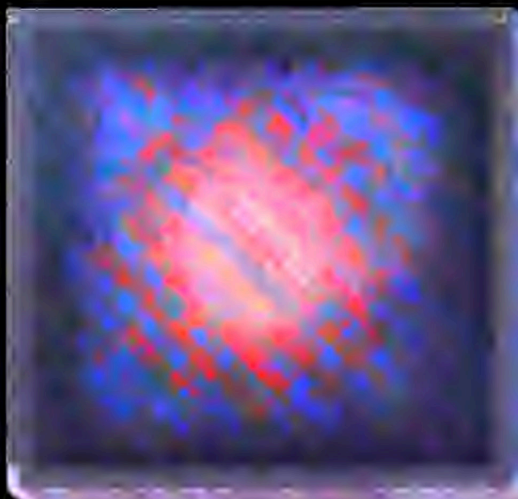

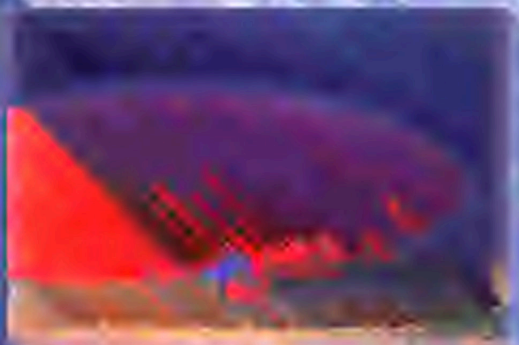









CHAPTER 10 Similarity and Trigonometry

Lesson 1

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Lesson 2

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Lesson 3

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Lesson 4

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Lesson 5

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Lesson 12

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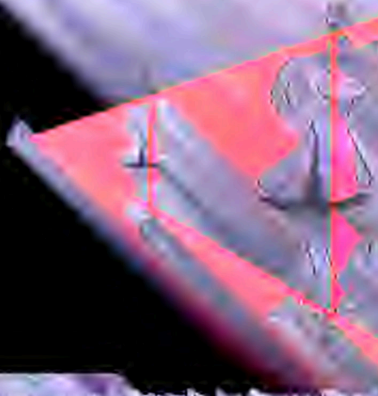







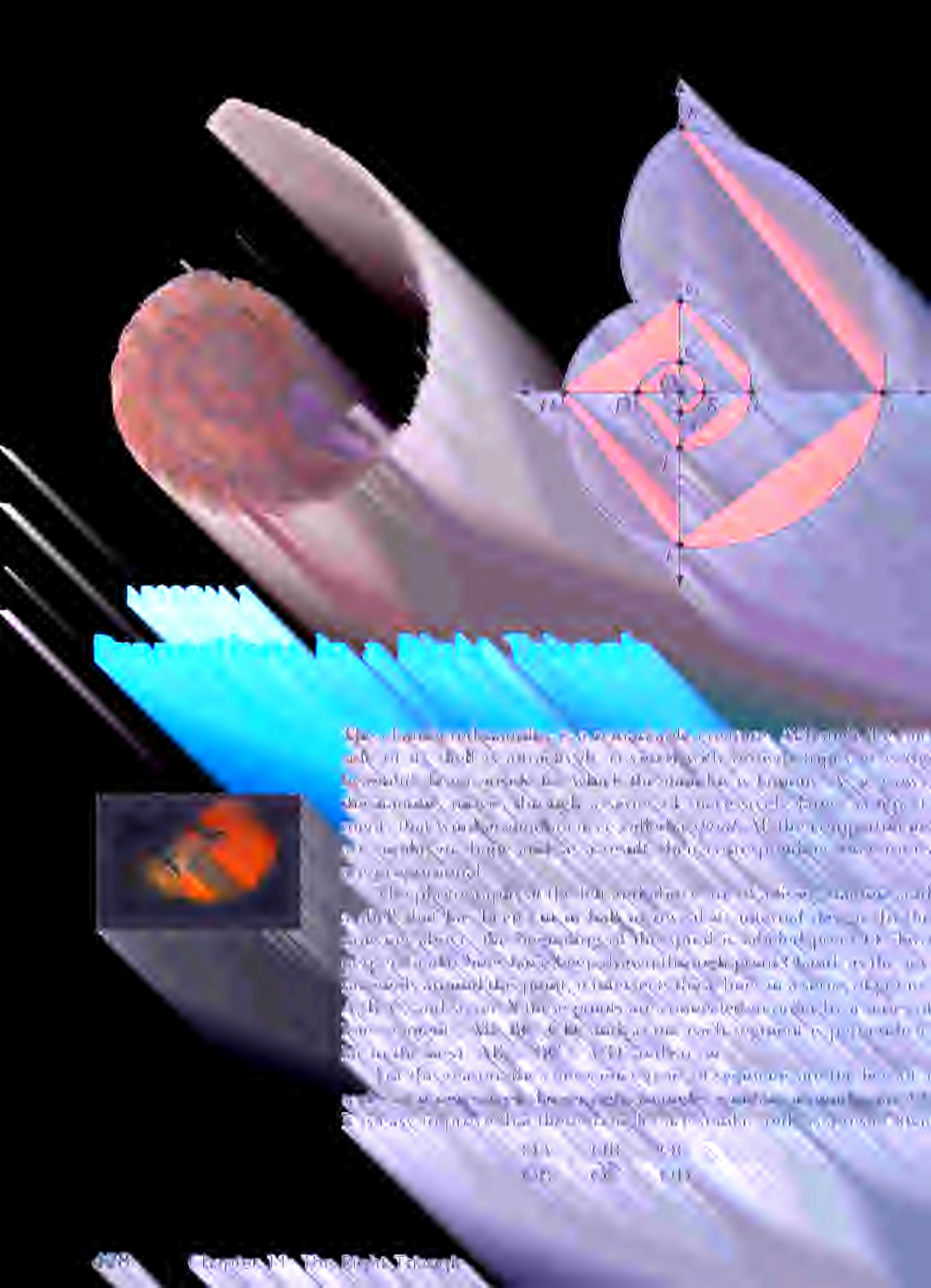





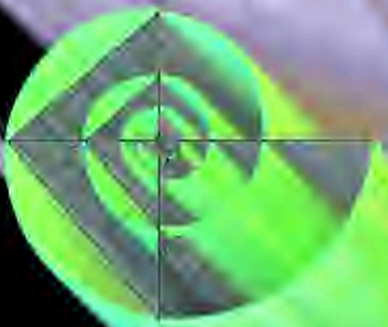

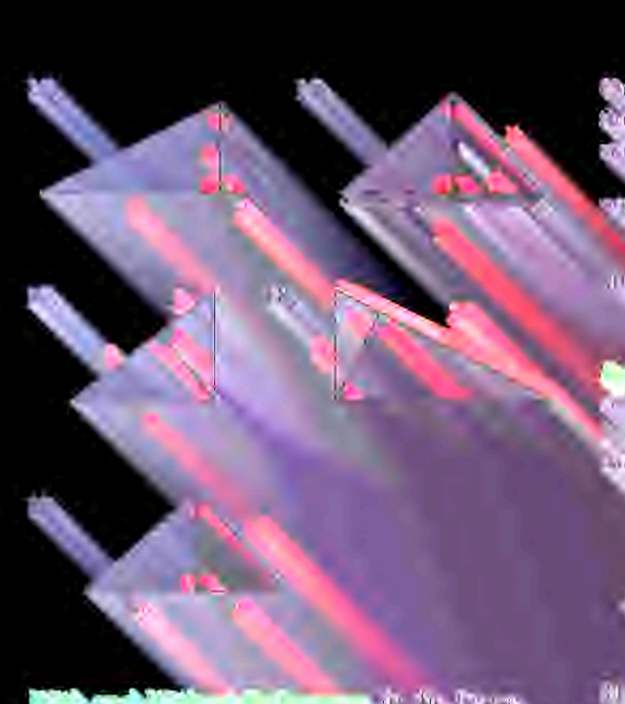







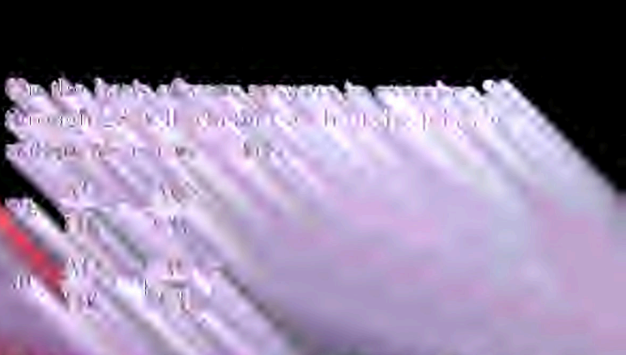



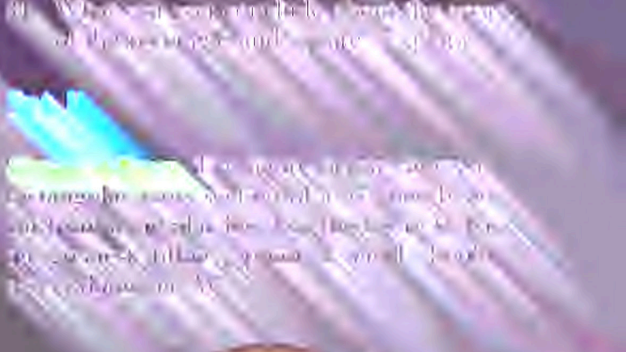





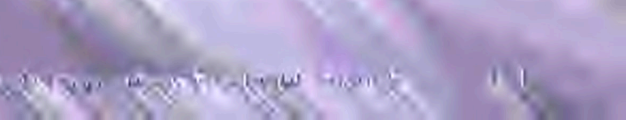







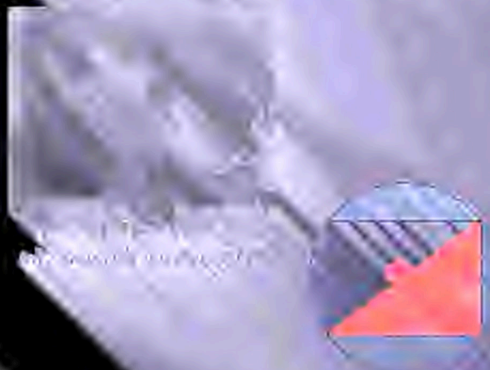

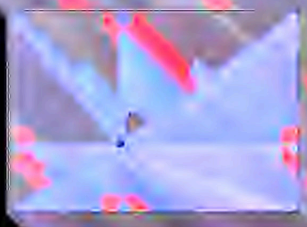



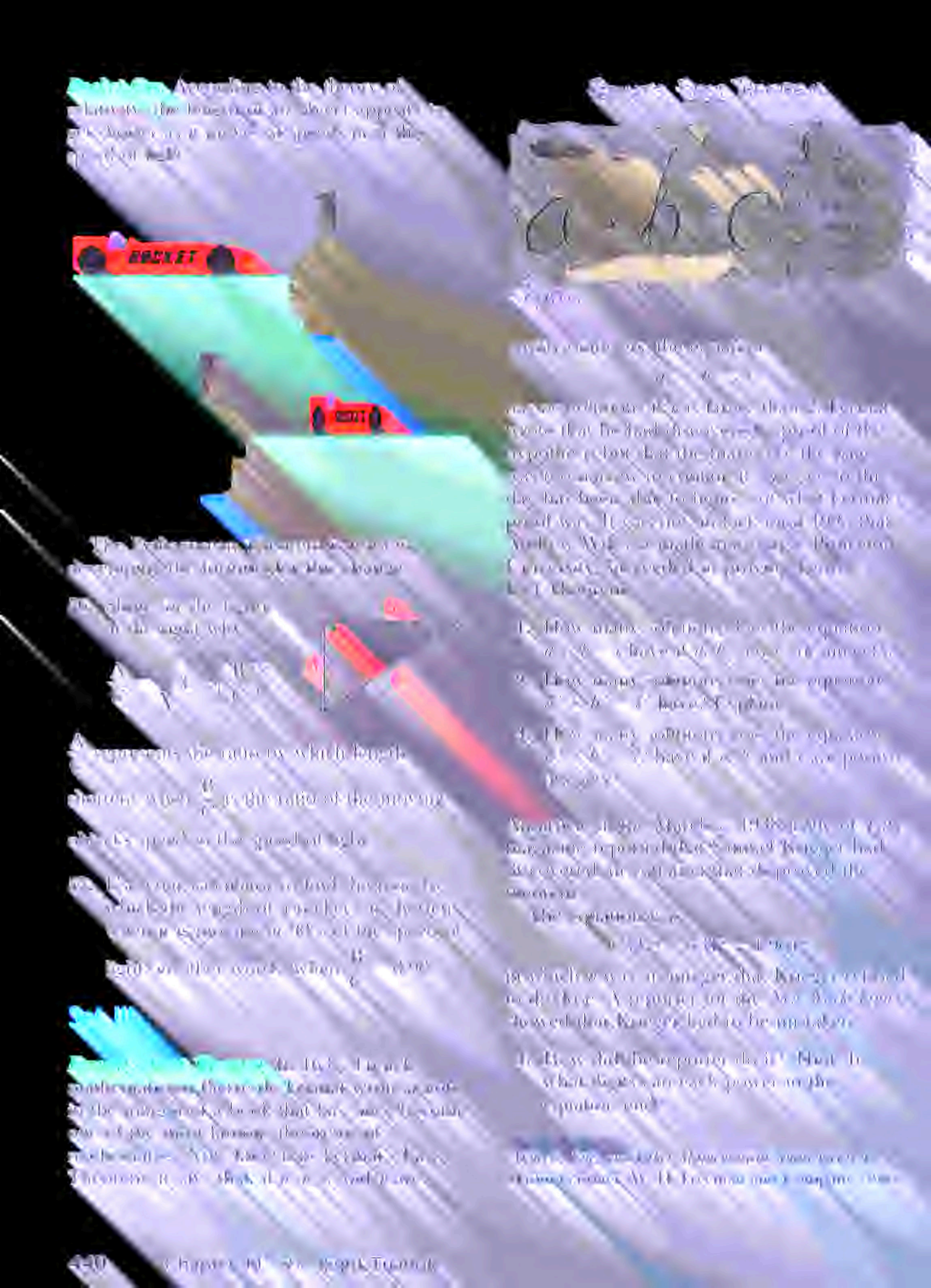
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The Observable Universe

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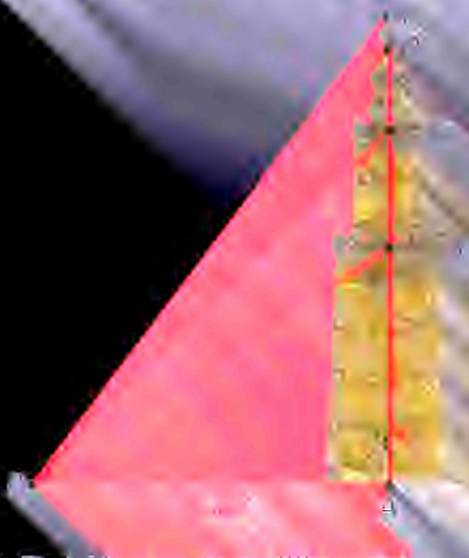

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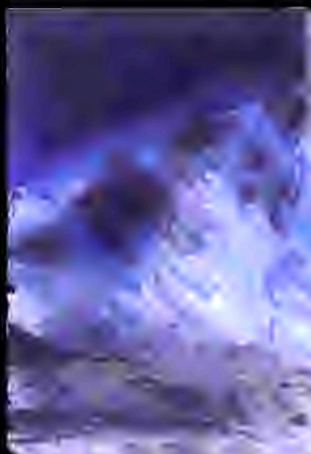

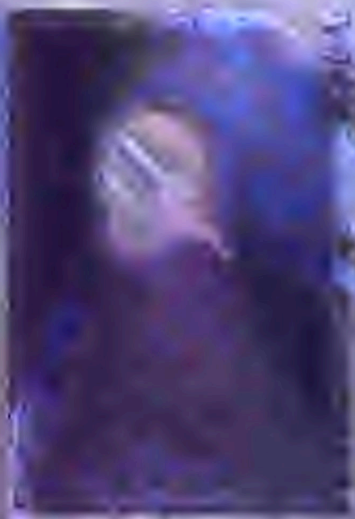





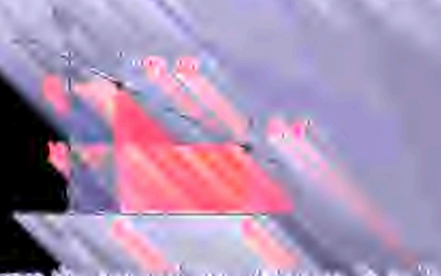



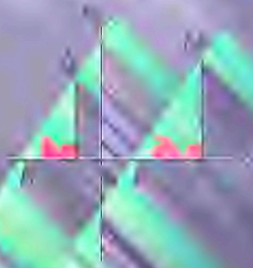

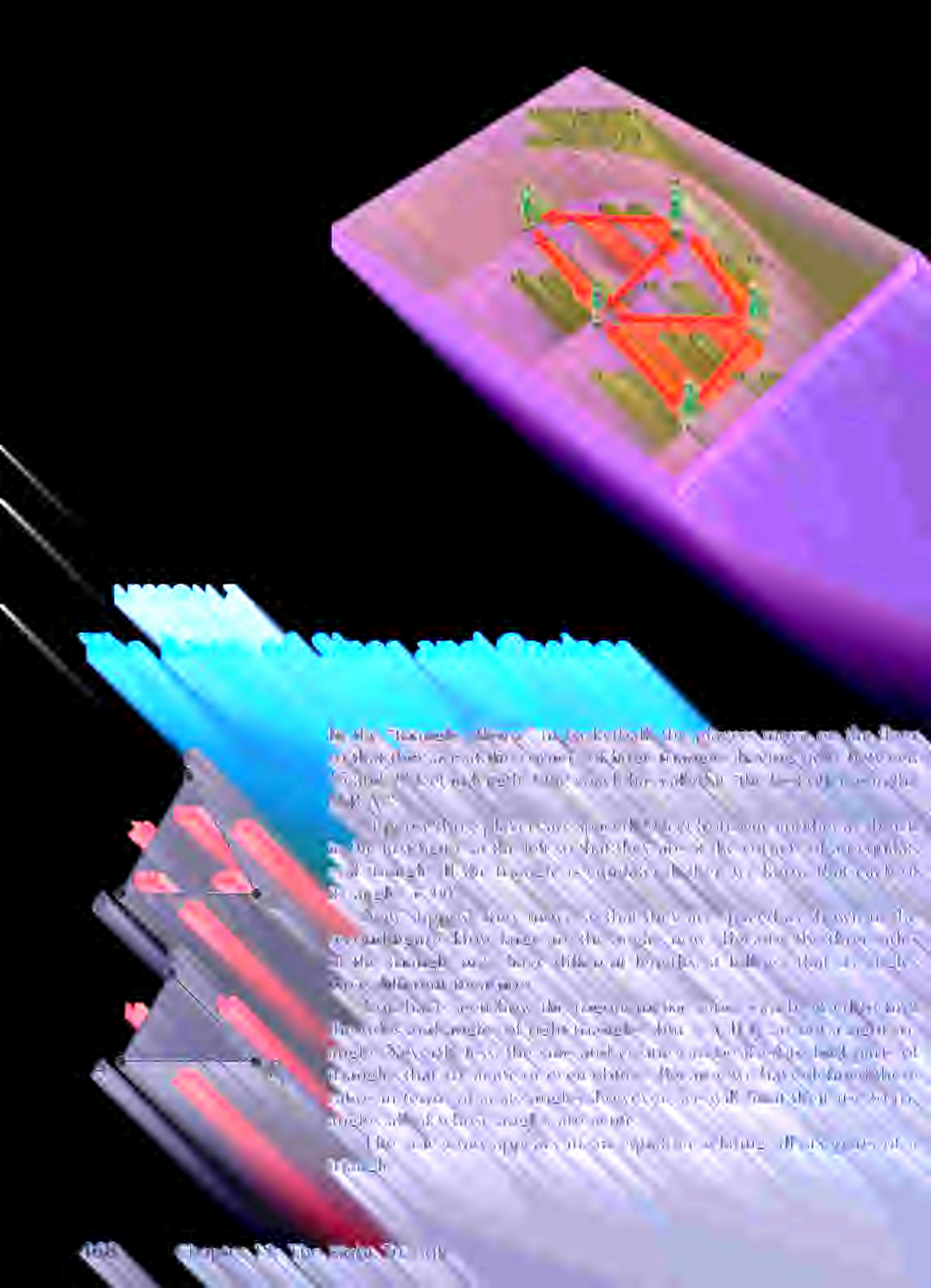











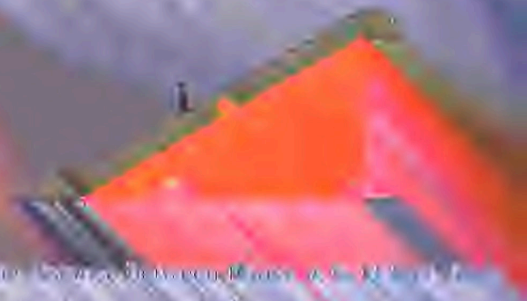



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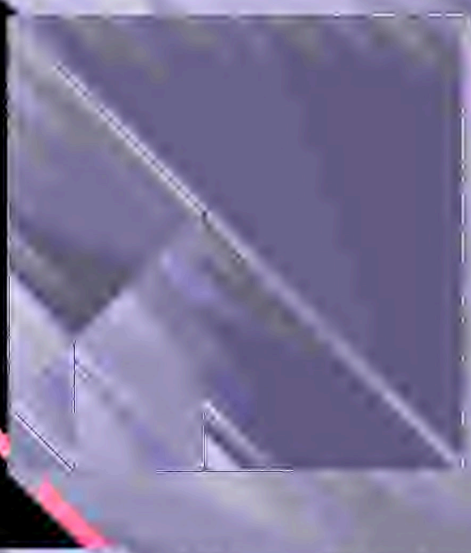

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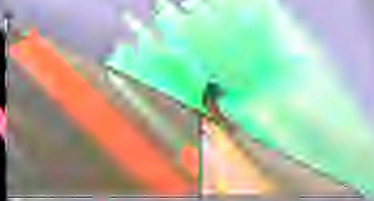
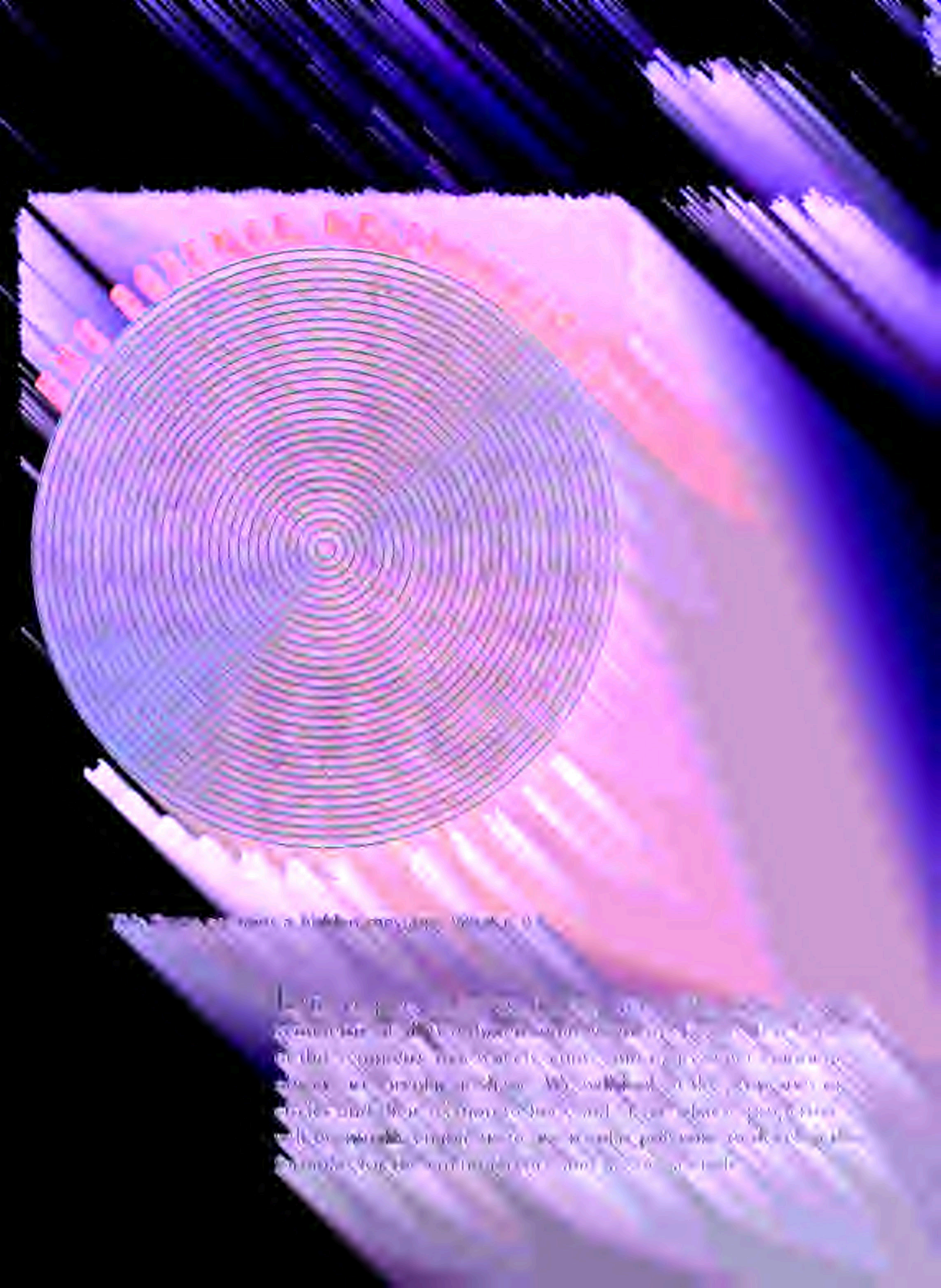




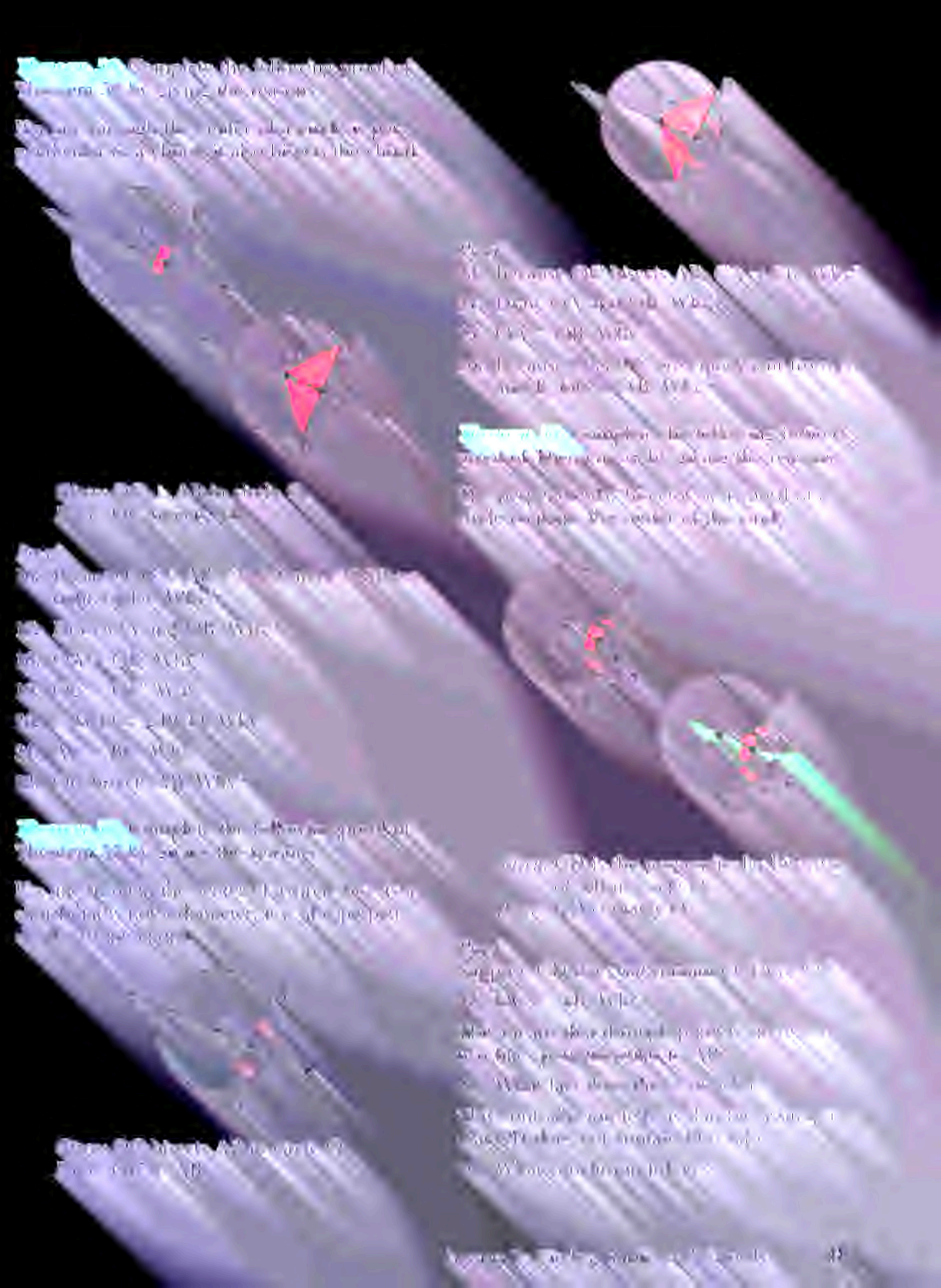












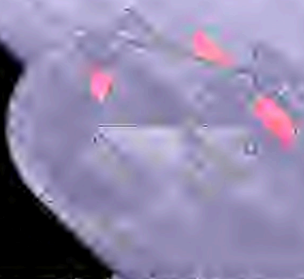


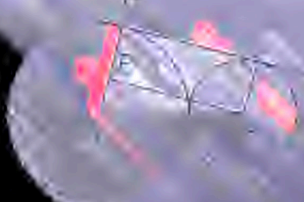


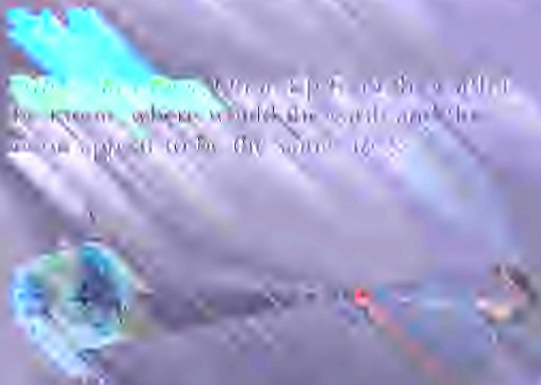




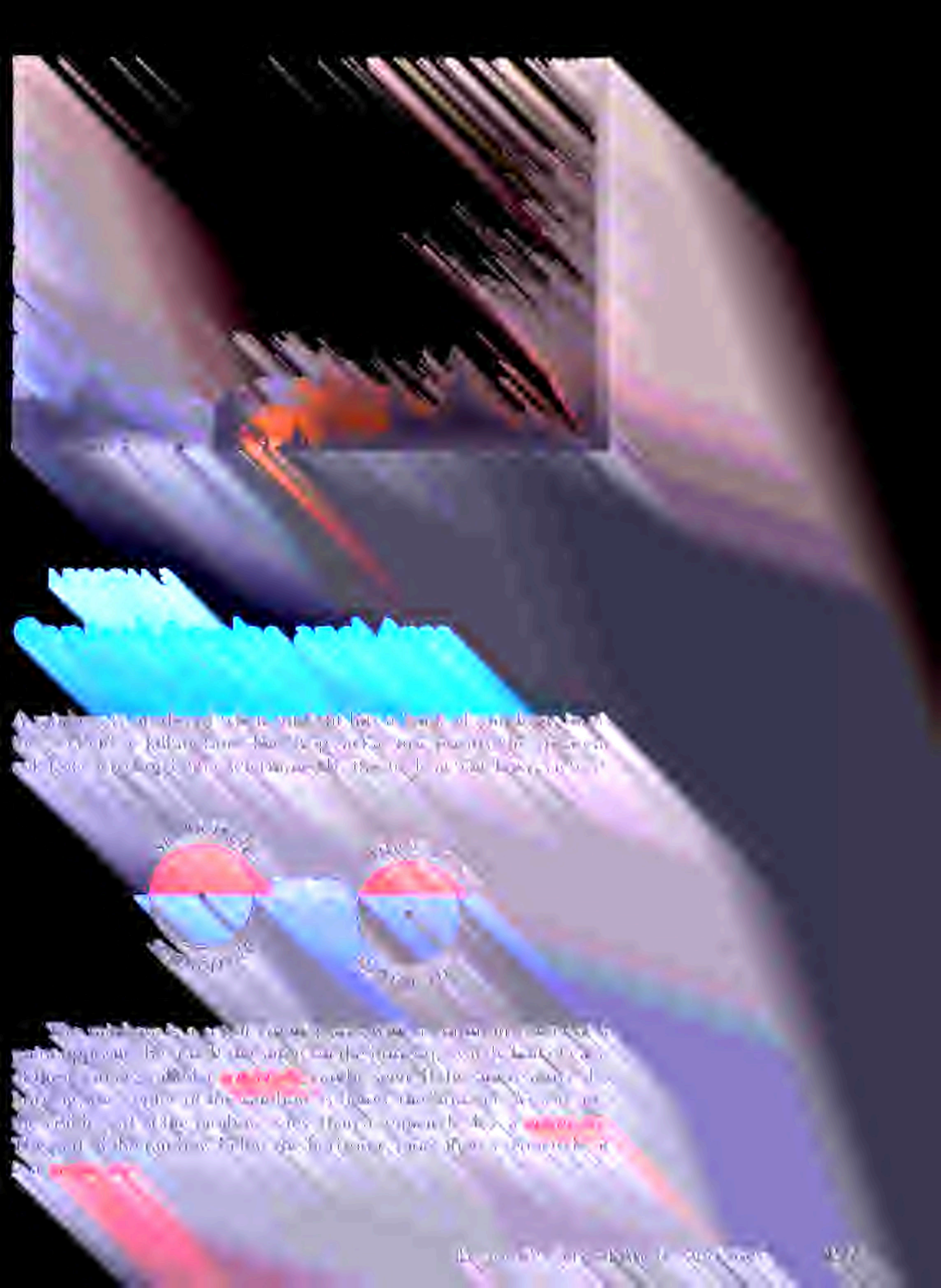












In the figure to the right, points A, B and C lie on circle O. Inscribed angle $\angle ABC$ intercepts arc $\overset{\frown}{AC}$.

Inscribed angle $\angle ABC$ intercepts arc $\overset{\frown}{AC}$.

The measure of an inscribed angle is equal to half the measure of its intercepted arc.

$$m\angle ABC = \frac{1}{2} m\overset{\frown}{AC}$$

$$m\overset{\frown}{AC} = 2 \cdot m\angle ABC$$

$$m\angle ABC = \frac{1}{2} \cdot 120^\circ$$

$$m\angle ABC = 60^\circ$$

Any inscribed angle that intercepts a semicircle is a right angle.

Any inscribed angle that intercepts a semicircle is a right angle.

Any inscribed angle that intercepts a semicircle is a right angle.

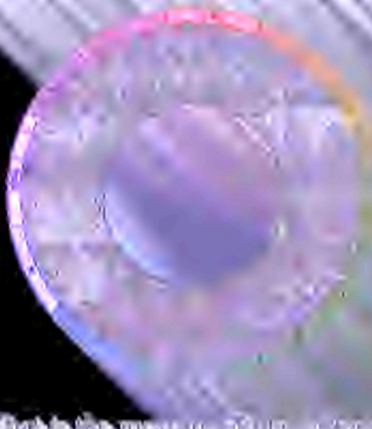







EDISON'S











Complete the following proof of Theorem 10.8 by giving the reasons.

Theorem 10.8: An angle inscribed in a circle is equal to half the measure of the central angle subtending the same arc.

Given: $\angle APB$ is an inscribed angle and $\angle AOB$ is a central angle subtending the same arc $\overset{\frown}{AB}$.

Prove: $m\angle APB = \frac{1}{2} m\angle AOB$

Proof:

Statements	Reasons
1. Draw $\overline{PO}$ and extend it to C.	1. Through any two points there is exactly one line.
2. $m\angle AOC = m\angle A + m\angle P$	2. The measure of an exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles.
3. $m\angle A = m\angle P$	3. Base angles of an isosceles triangle are congruent.
4. $m\angle AOC = m\angle P + m\angle P$	4. Substitution property
5. $m\angle AOC = 2m\angle P$	5. Addition
6. $m\angle P = \frac{1}{2} m\angle AOC$	6. Multiplication property
7. $m\angle APB = \frac{1}{2} m\angle AOB$	7. Substitution property

In the figure to the right, the sides of $\angle ABC$ are the secant lines $\overleftrightarrow{BA}$ and $\overleftrightarrow{BC}$. Which arcs are intercepted by $\angle ABC$?

a. $\overset{\frown}{AB}$

b. $\overset{\frown}{BC}$

c. $\overset{\frown}{AC}$

d. $\overset{\frown}{AB}$ and $\overset{\frown}{AC}$

e. $\overset{\frown}{AB}$ and $\overset{\frown}{BC}$

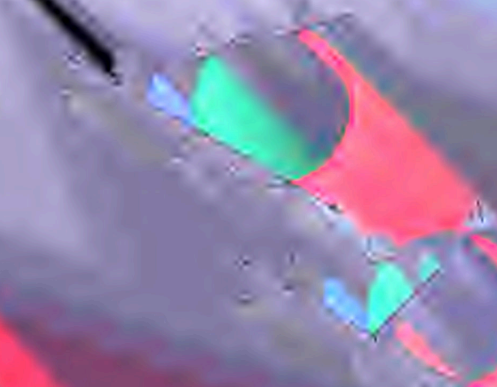
f. $\overset{\frown}{BC}$ and $\overset{\frown}{AC}$



Complete the following proof of Theorem 10.8 by giving the reasons.

Theorem 10.8: An angle inscribed in a circle is equal to half the measure of the central angle subtending the same arc.

Given: $\angle APB$ is an inscribed angle and $\angle AOB$ is a central angle subtending the same arc $\overset{\frown}{AB}$.



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In the figure to the right, the sides of $\angle ABC$ are the secant lines $\overleftrightarrow{BA}$ and $\overleftrightarrow{BC}$. Which arcs are intercepted by $\angle ABC$?

a. $\overset{\frown}{AB}$

b. $\overset{\frown}{BC}$

c. $\overset{\frown}{AC}$

d. $\overset{\frown}{AB}$ and $\overset{\frown}{AC}$

e. $\overset{\frown}{AB}$ and $\overset{\frown}{BC}$

f. $\overset{\frown}{BC}$ and $\overset{\frown}{AC}$











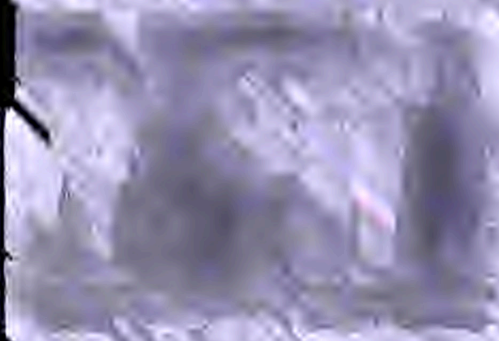

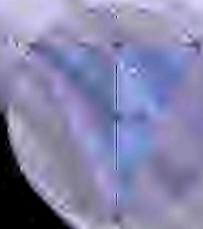



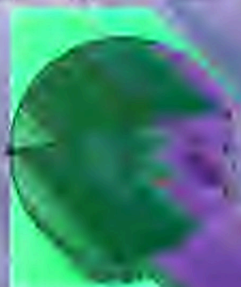



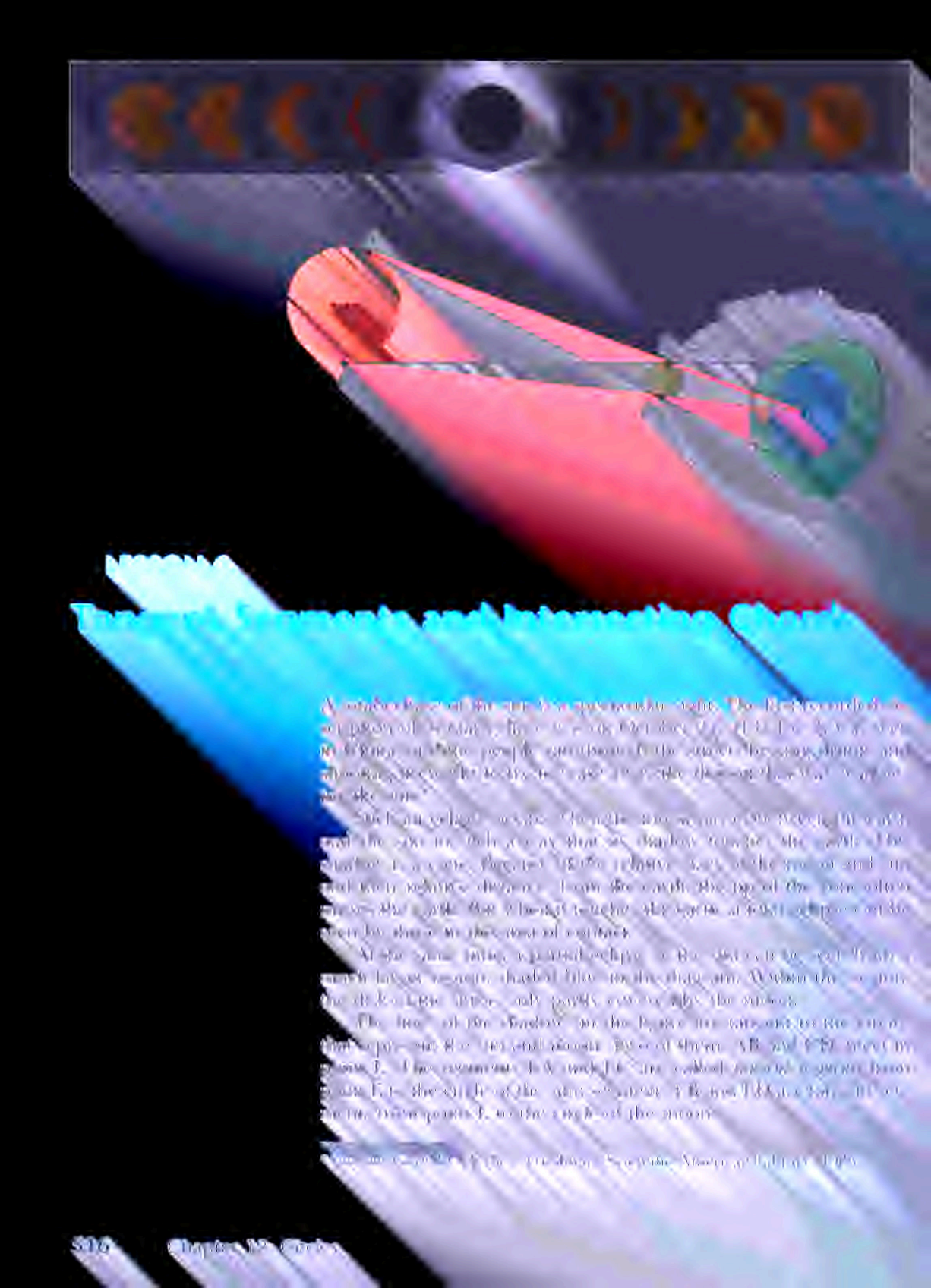







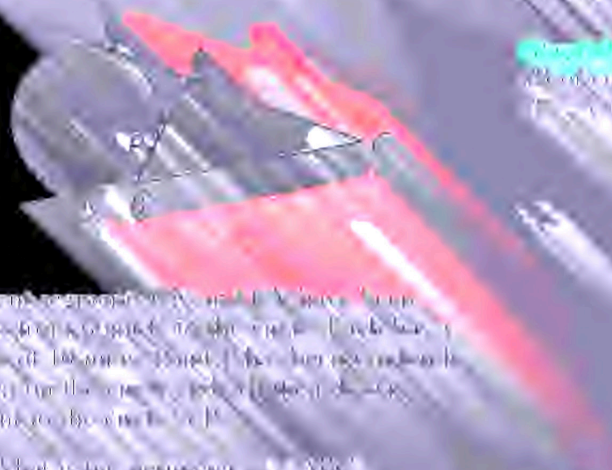



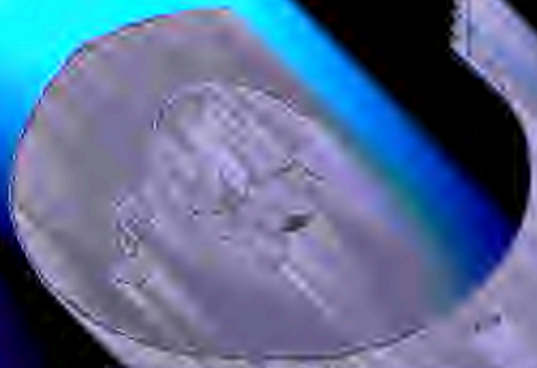











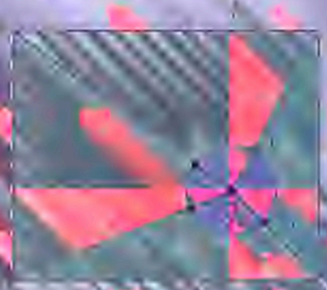









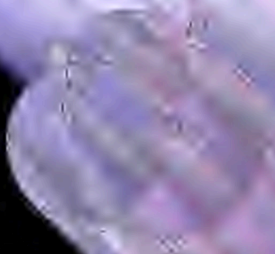



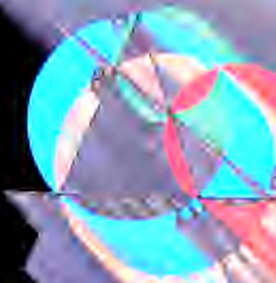





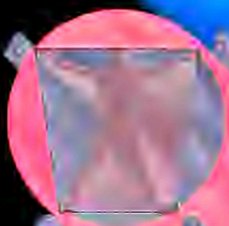



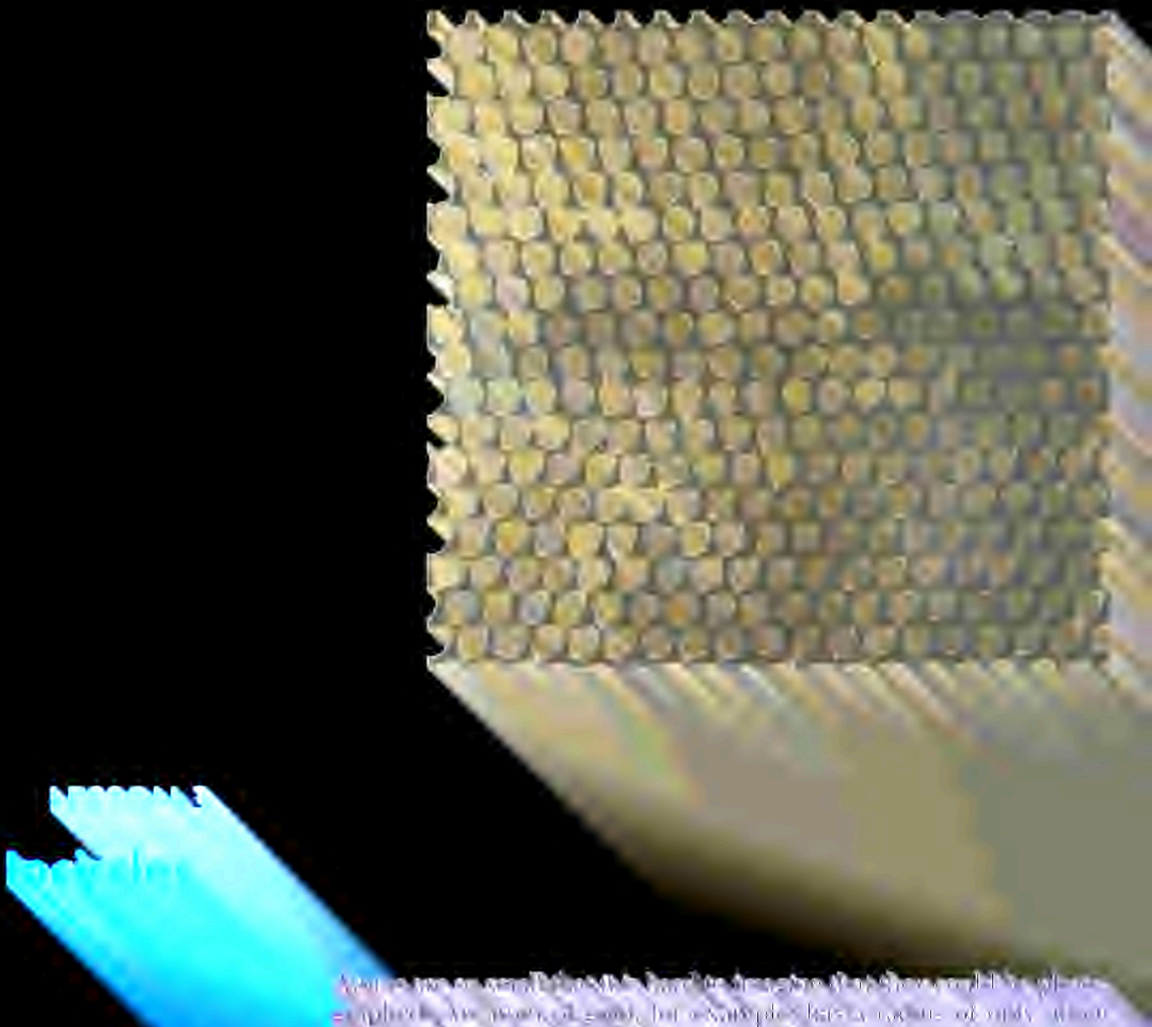


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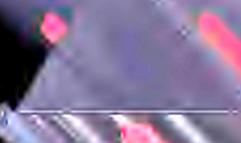
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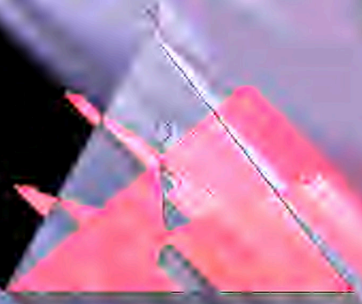



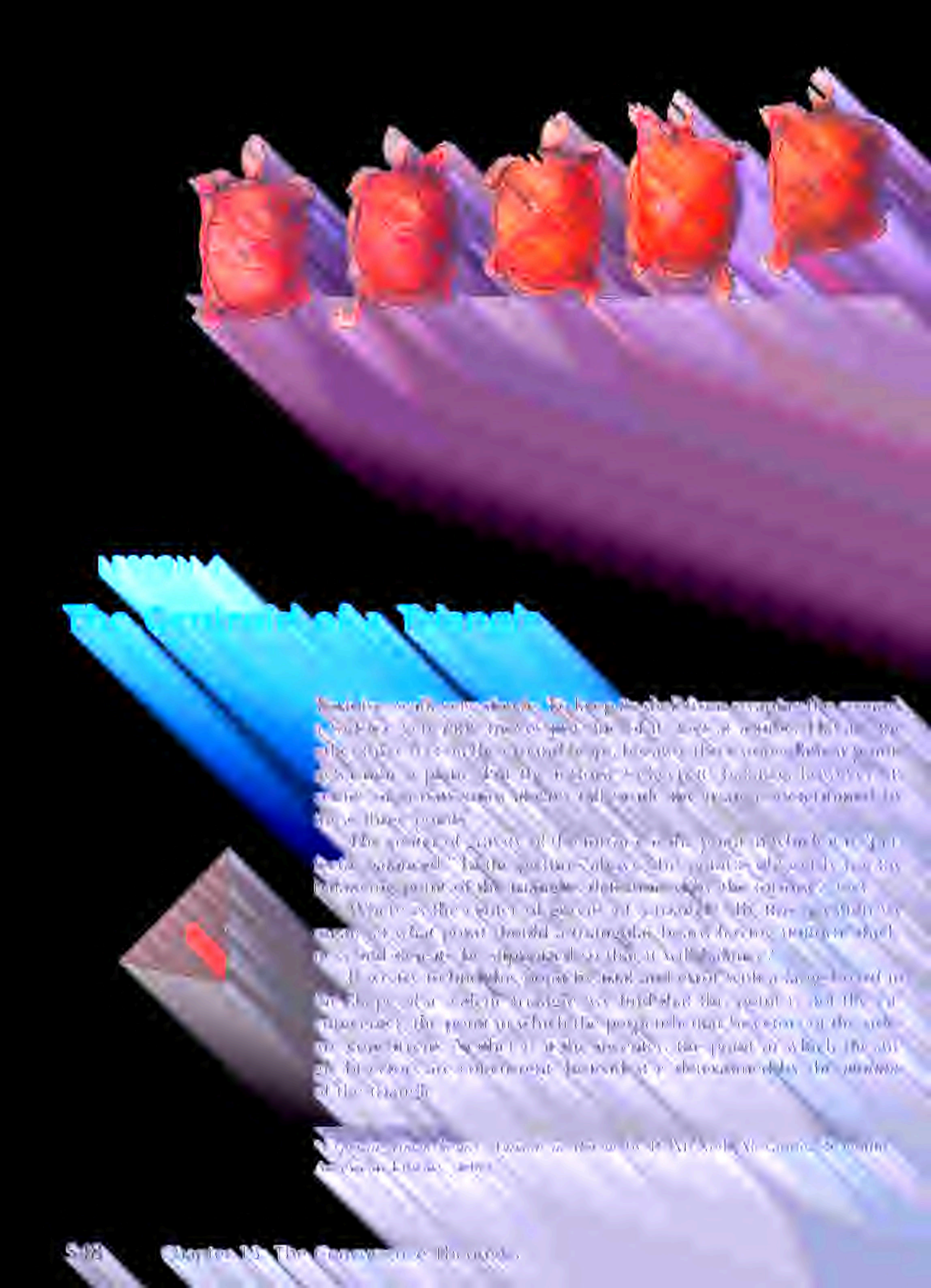

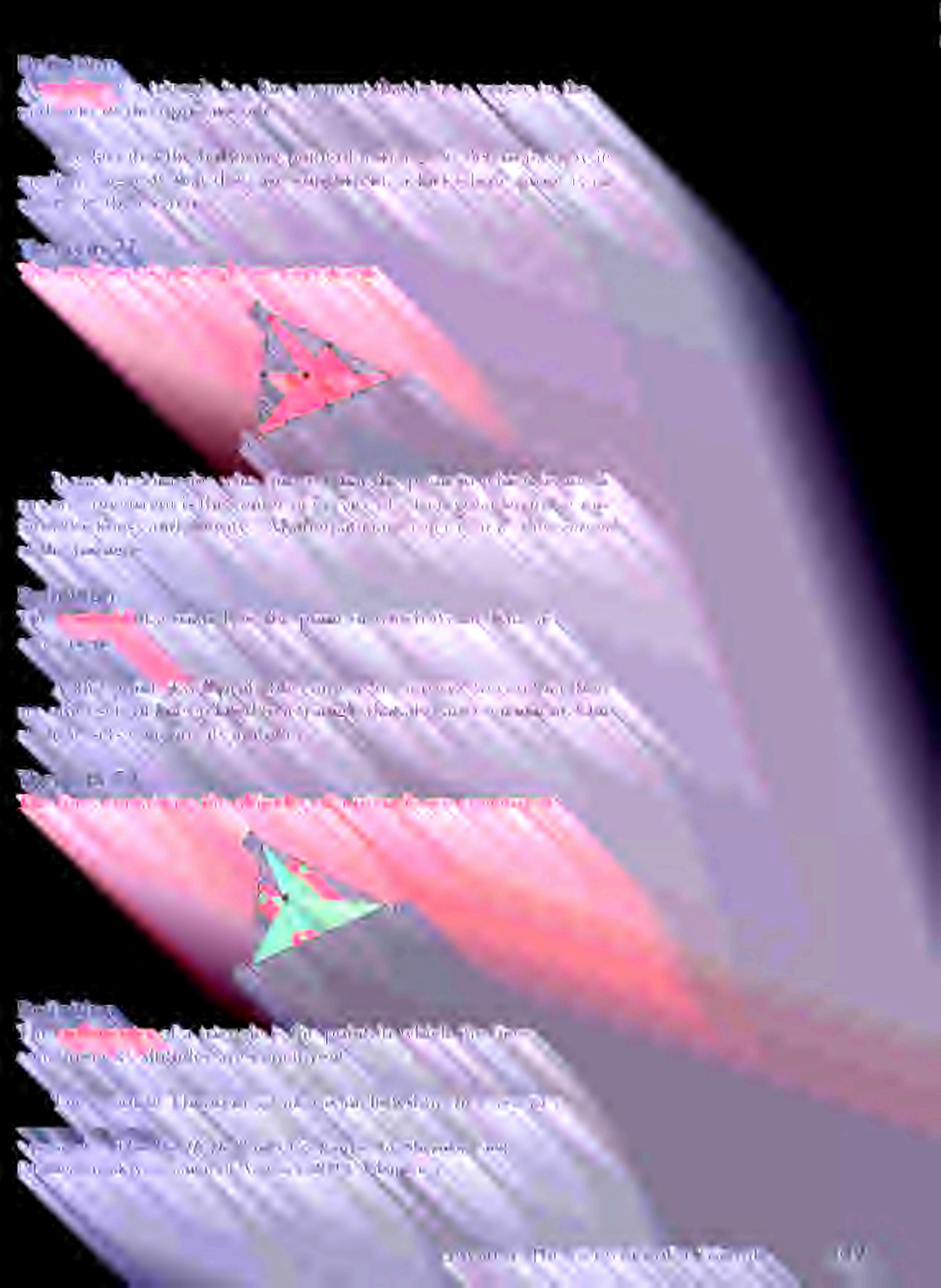

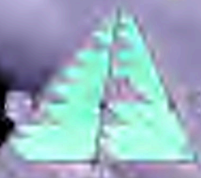

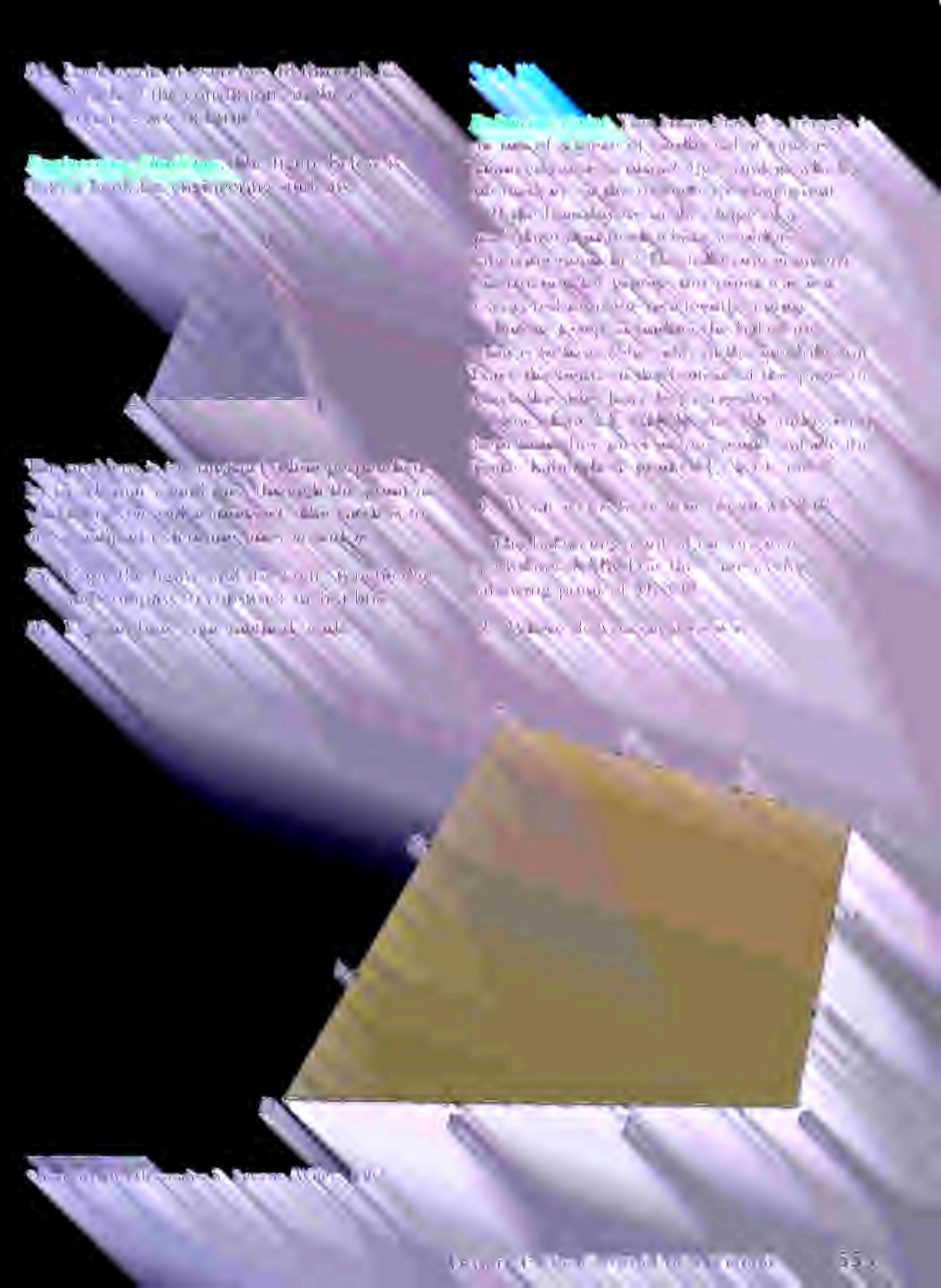

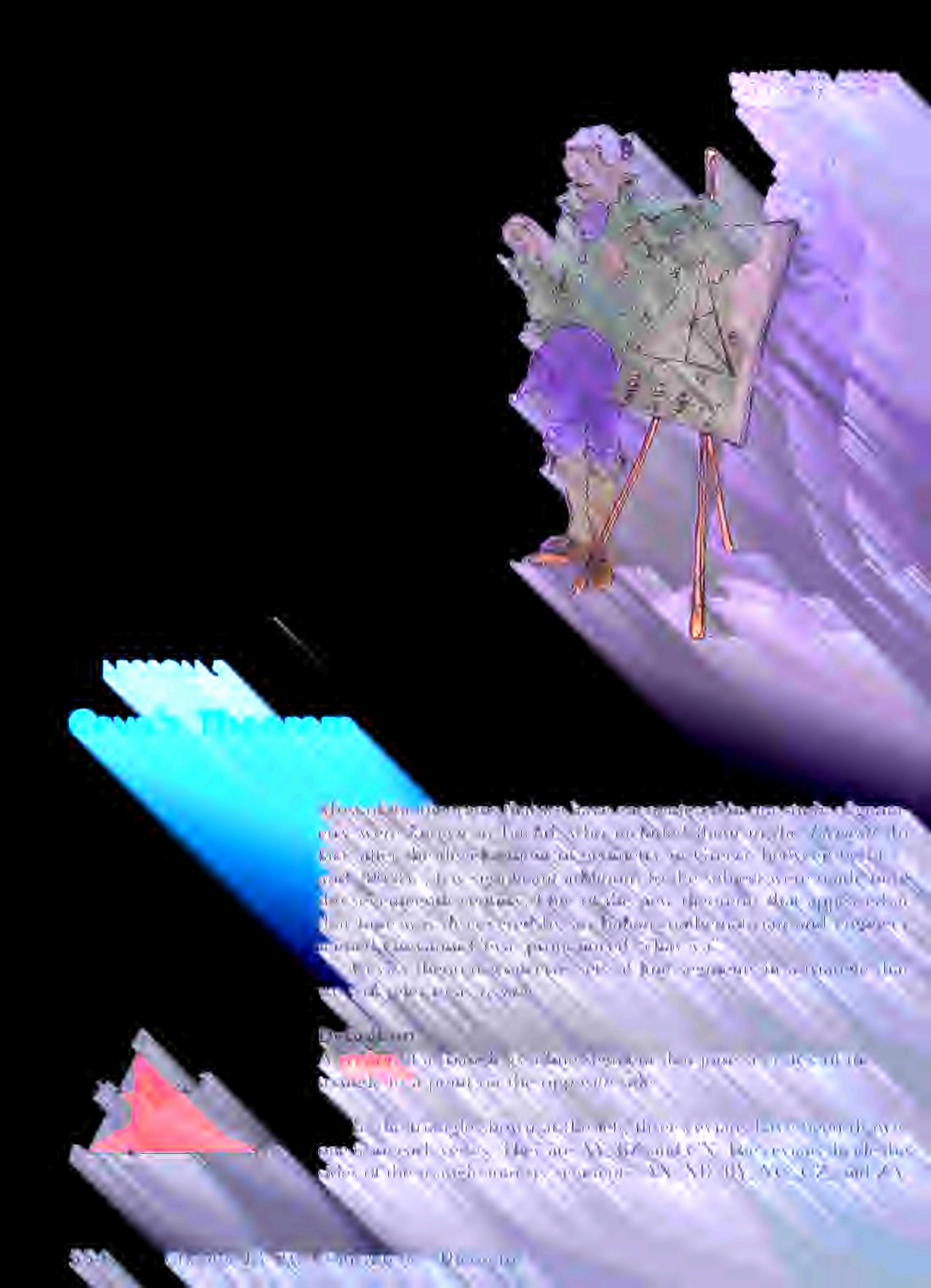



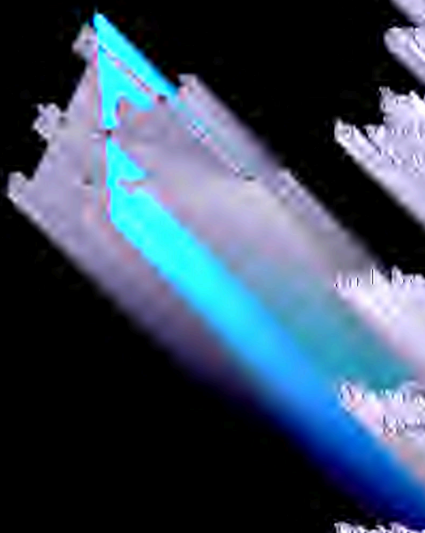

Proof of the converse

$$\frac{AX}{XB} = \frac{BY}{YC} = \frac{CZ}{ZA} = k$$ then the three cevians AX, BY and CZ are concurrent.

Let X and Z be the points on the lines AB and AC such that $\frac{AX}{XB} = \frac{AZ}{ZC} = k$. Let Y be the point on the line BC such that $\frac{BY}{YC} = k$.

Now, from the hypothesis we have that

$$\frac{AX}{XB} = \frac{BY}{YC} = \frac{CZ}{ZA} = k$$

and by the Menelaus theorem we have

$$\frac{AX}{XB} \cdot \frac{BY}{YC} \cdot \frac{CZ}{ZA} = 1$$

Substituting from the hypothesis, we have $k \cdot k \cdot k = 1$, so $k = 1$. Hence we have that

$$\frac{AX}{XB} = \frac{BY}{YC} = \frac{CZ}{ZA} = \frac{AX}{XB} = \frac{BY}{YC} = \frac{CZ}{ZA}$$

Dividing we get

$$\frac{BY}{YC} = \frac{BY}{YC}$$

Adding 1 to each side of the equation we get

$$\frac{BY}{YC} + 1 = \frac{BY}{YC} + 1$$

$$\frac{BY + YC}{YC} = \frac{BY + YC}{YC}$$

Because $BY + YC = BC$ and $BY + YC = BC$

$$\frac{BC}{YC} = \frac{BC}{YC}$$

Multiplying both sides by the length of YC

$$BC = YC \cdot \frac{BC}{YC} = YC \cdot \frac{BC}{YC}$$

Dividing by BC we get

$$YC = YC$$

Because $CY = CY'$, Y and Y' are the same point. This contradiction follows from the Euclid Postulate, which says that the point on a line can be identified by the distance from a fixed point. Hence the point Y corresponds exactly one point, because Y and Y' are the same point. AY and AY' are the same line. Therefore AX, BY and CZ all contain point P and are concurrent.








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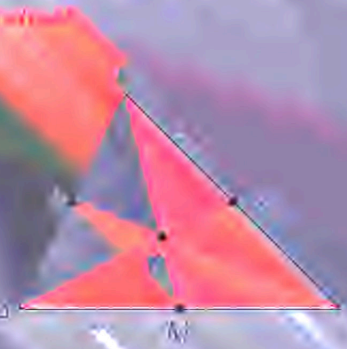
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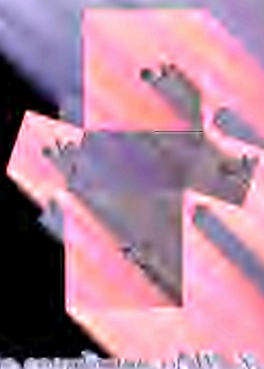





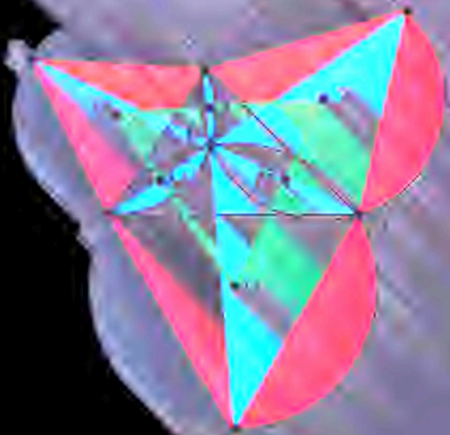



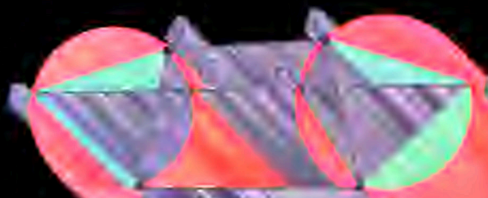







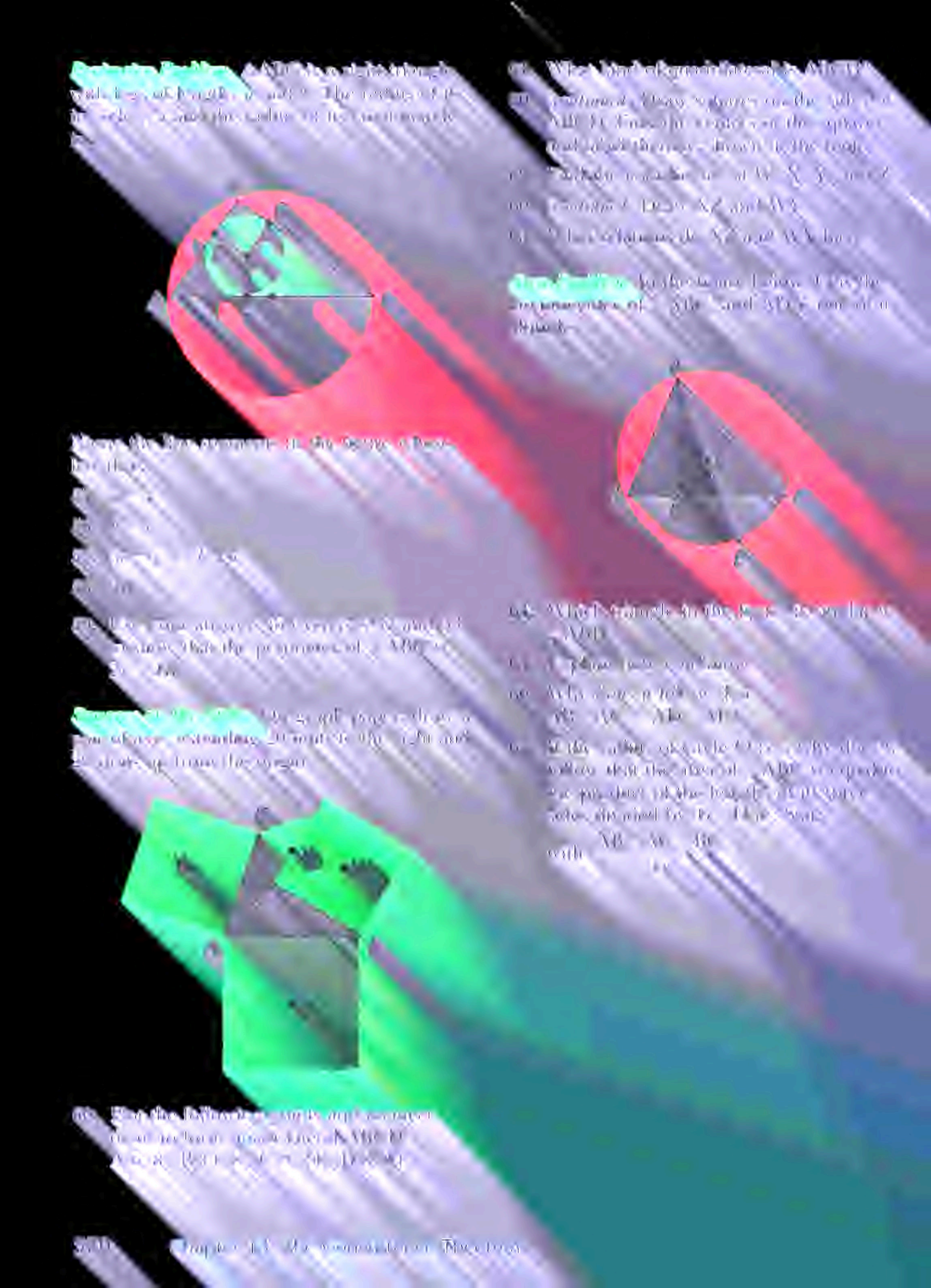



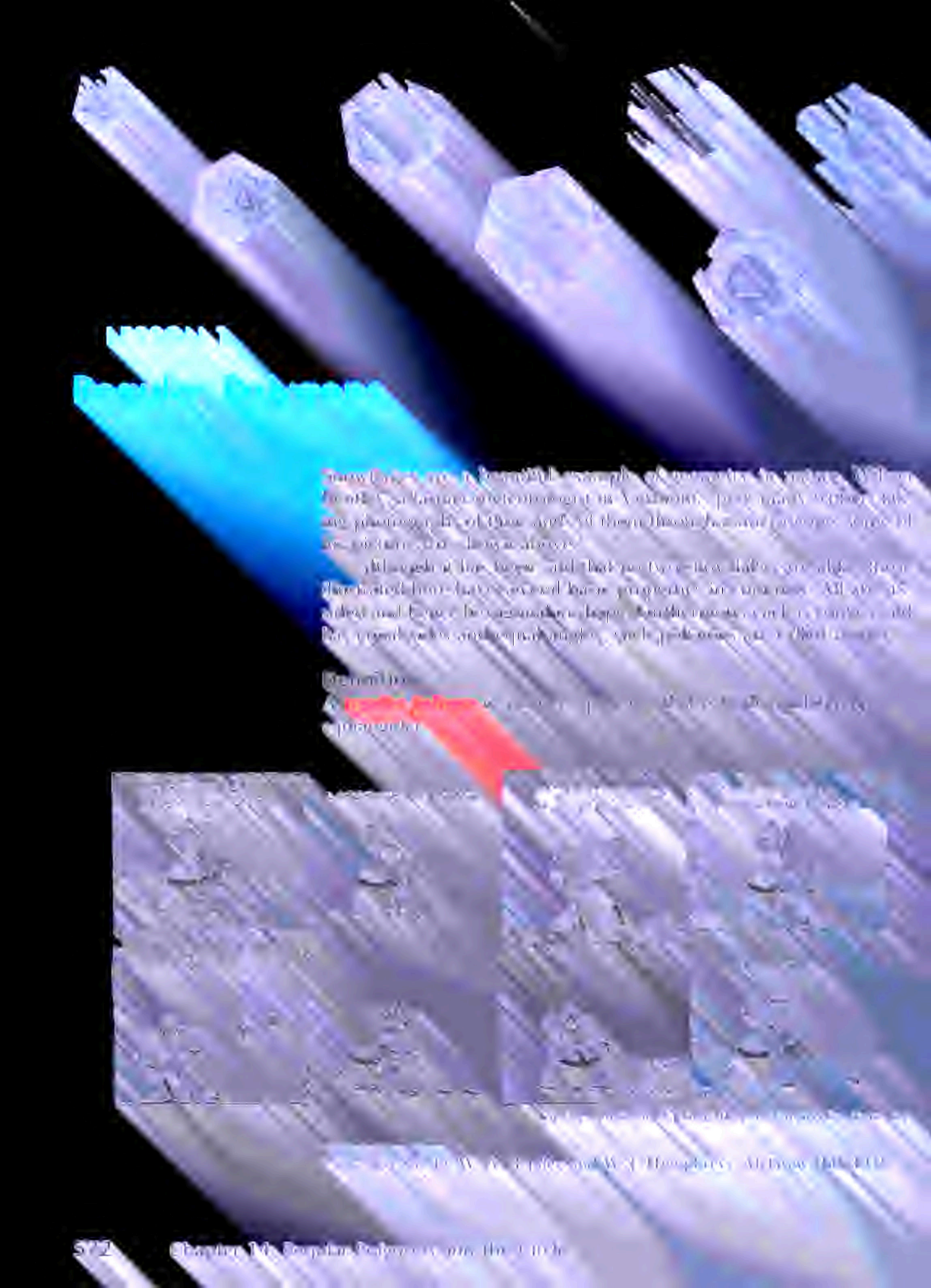

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Definition

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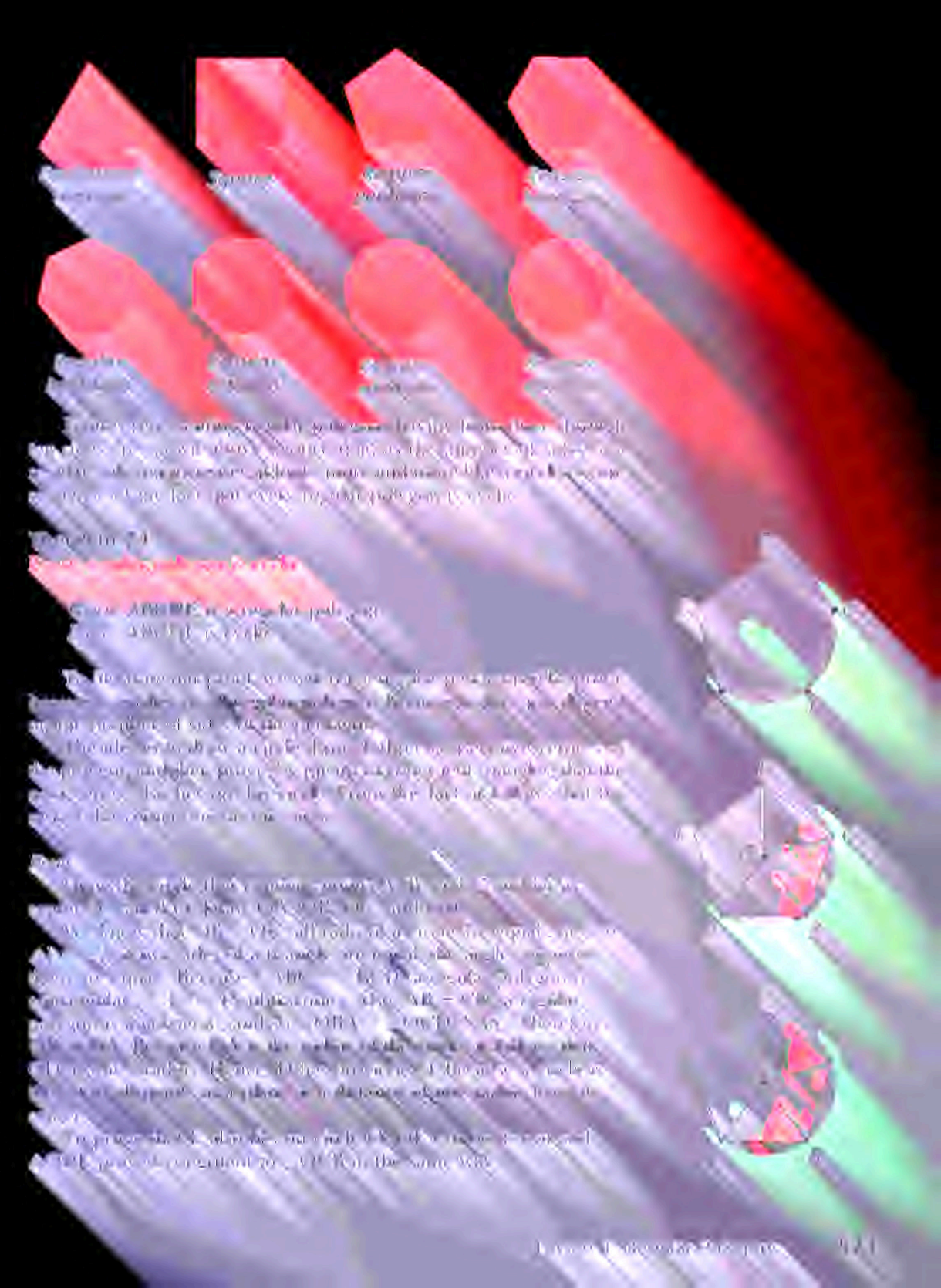





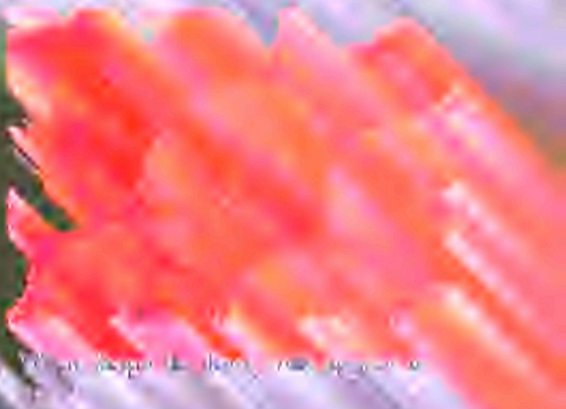



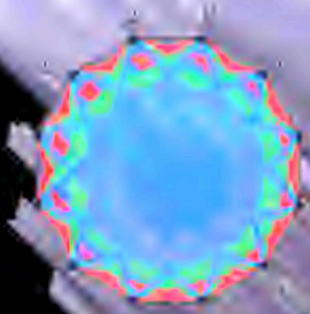



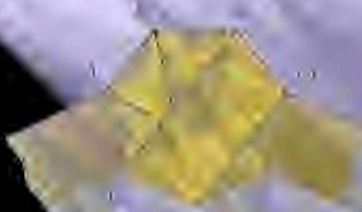

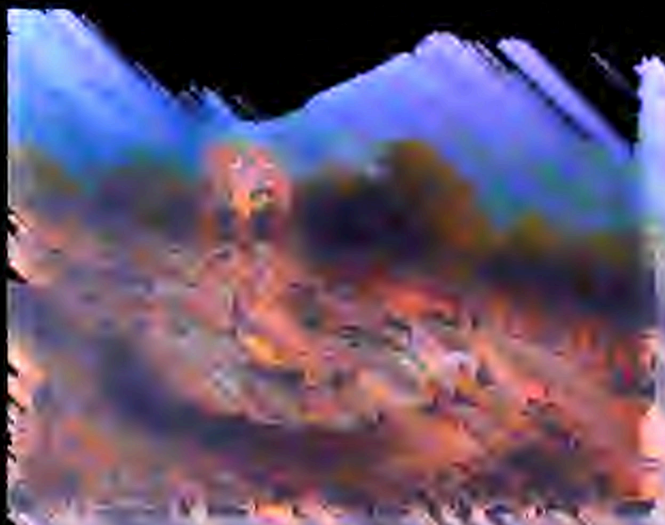



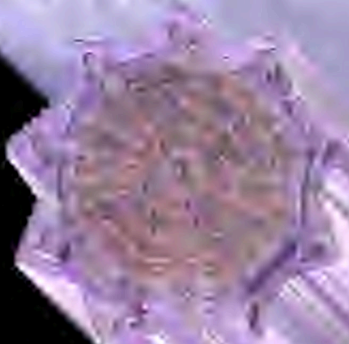

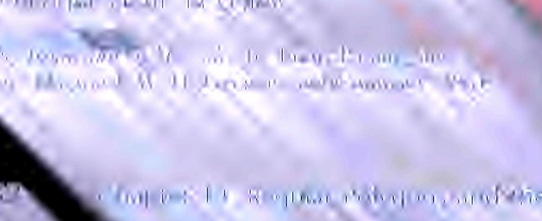



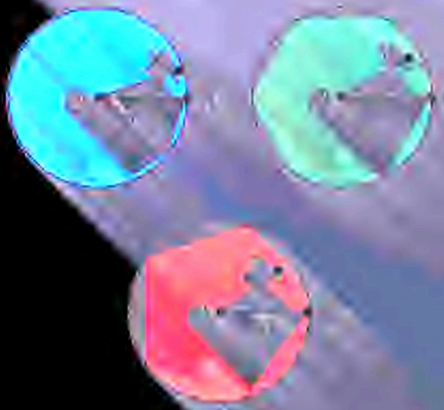



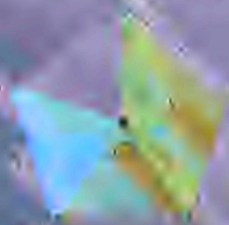

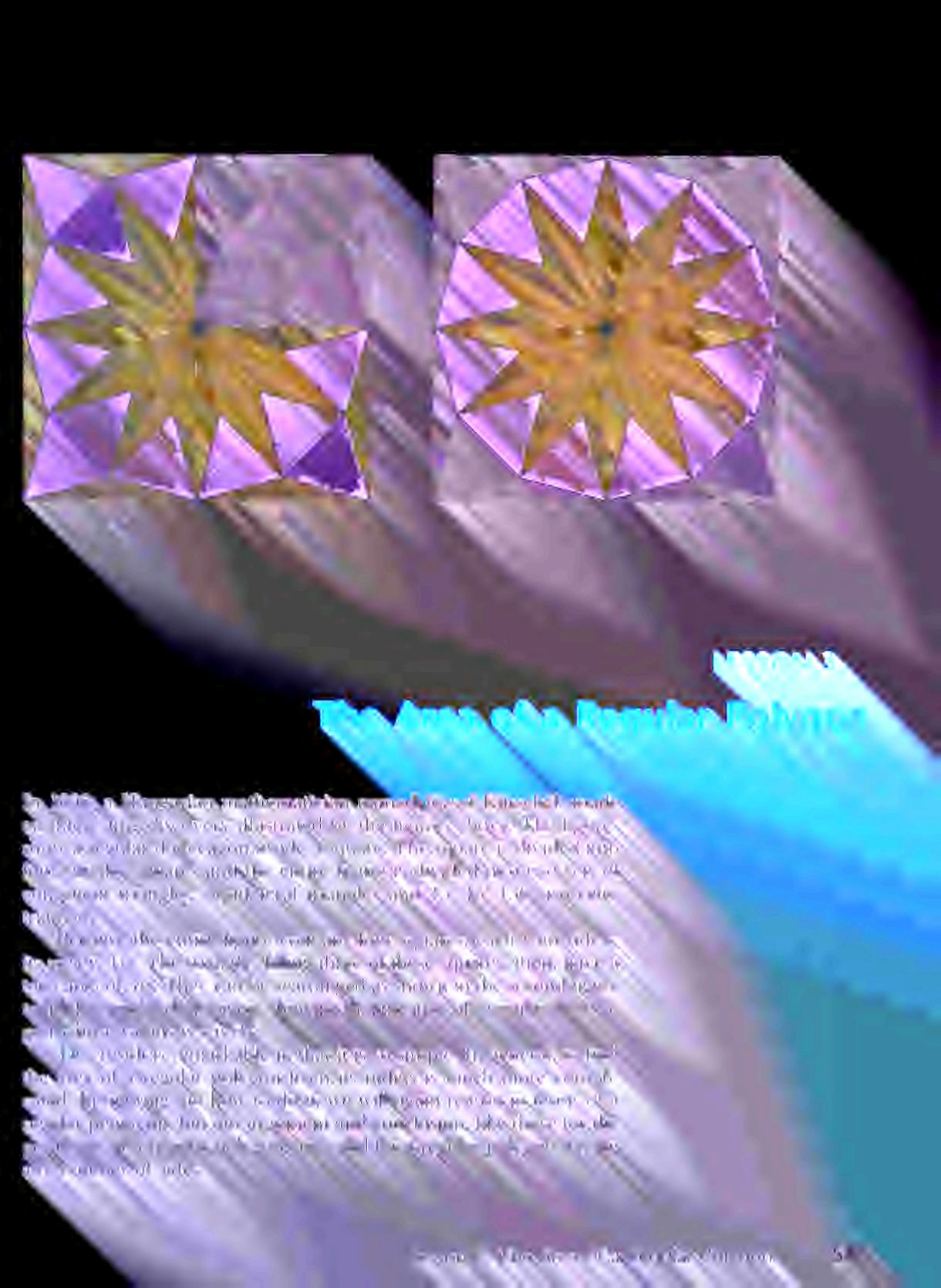







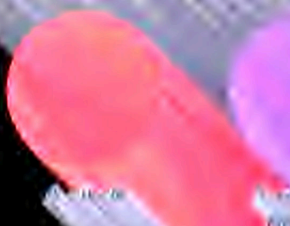





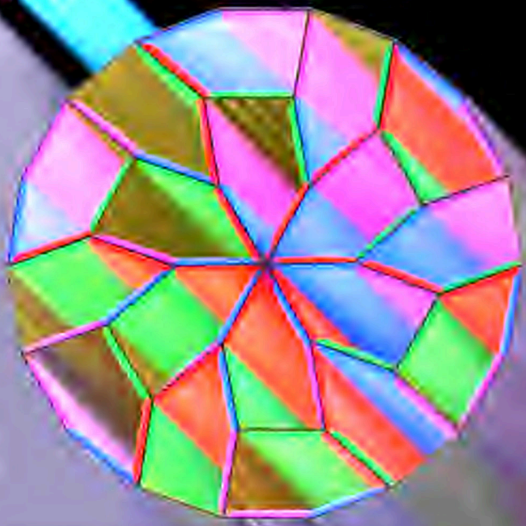

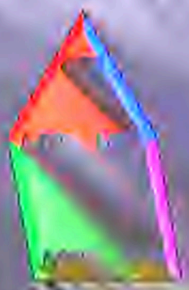

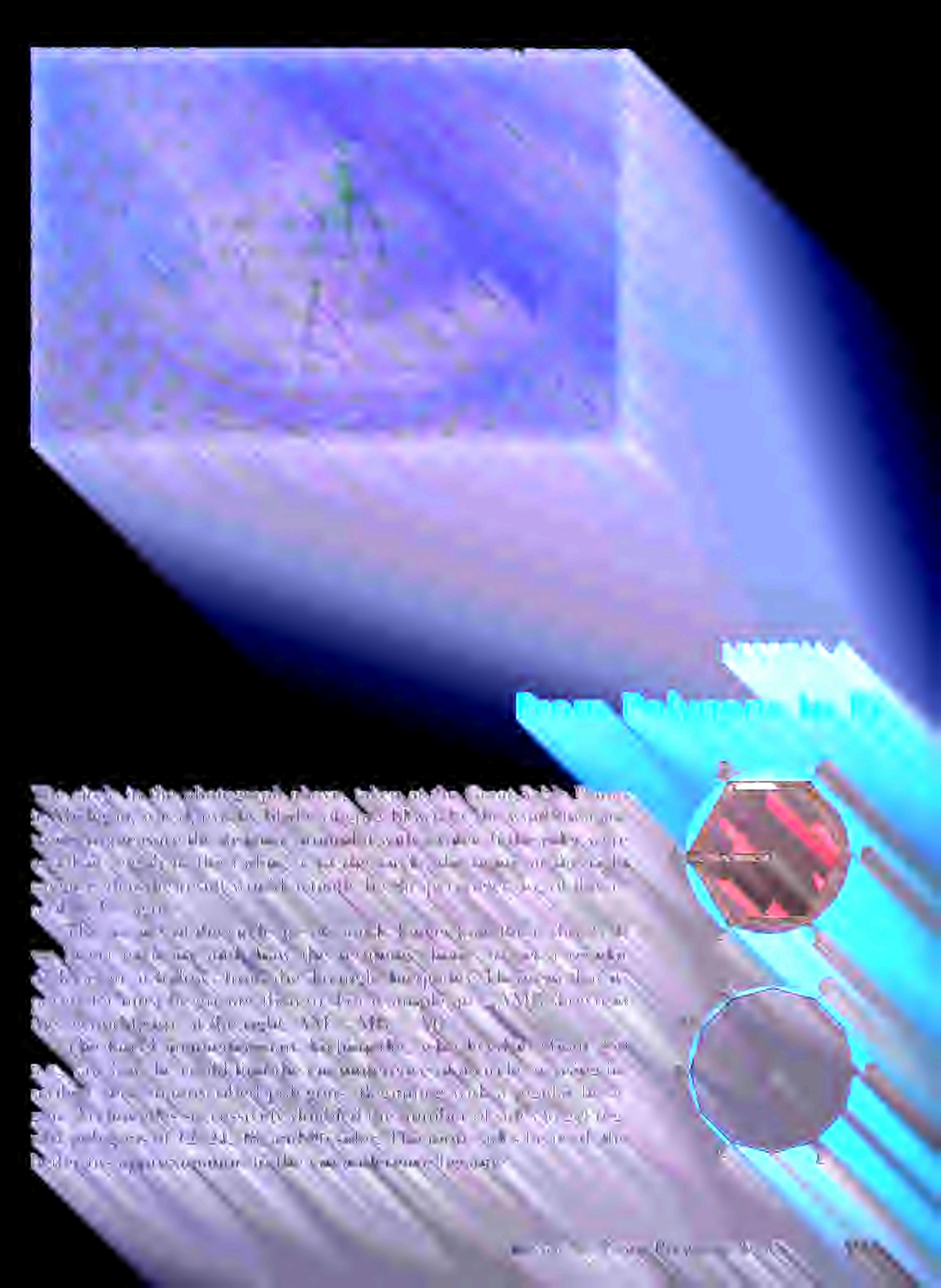

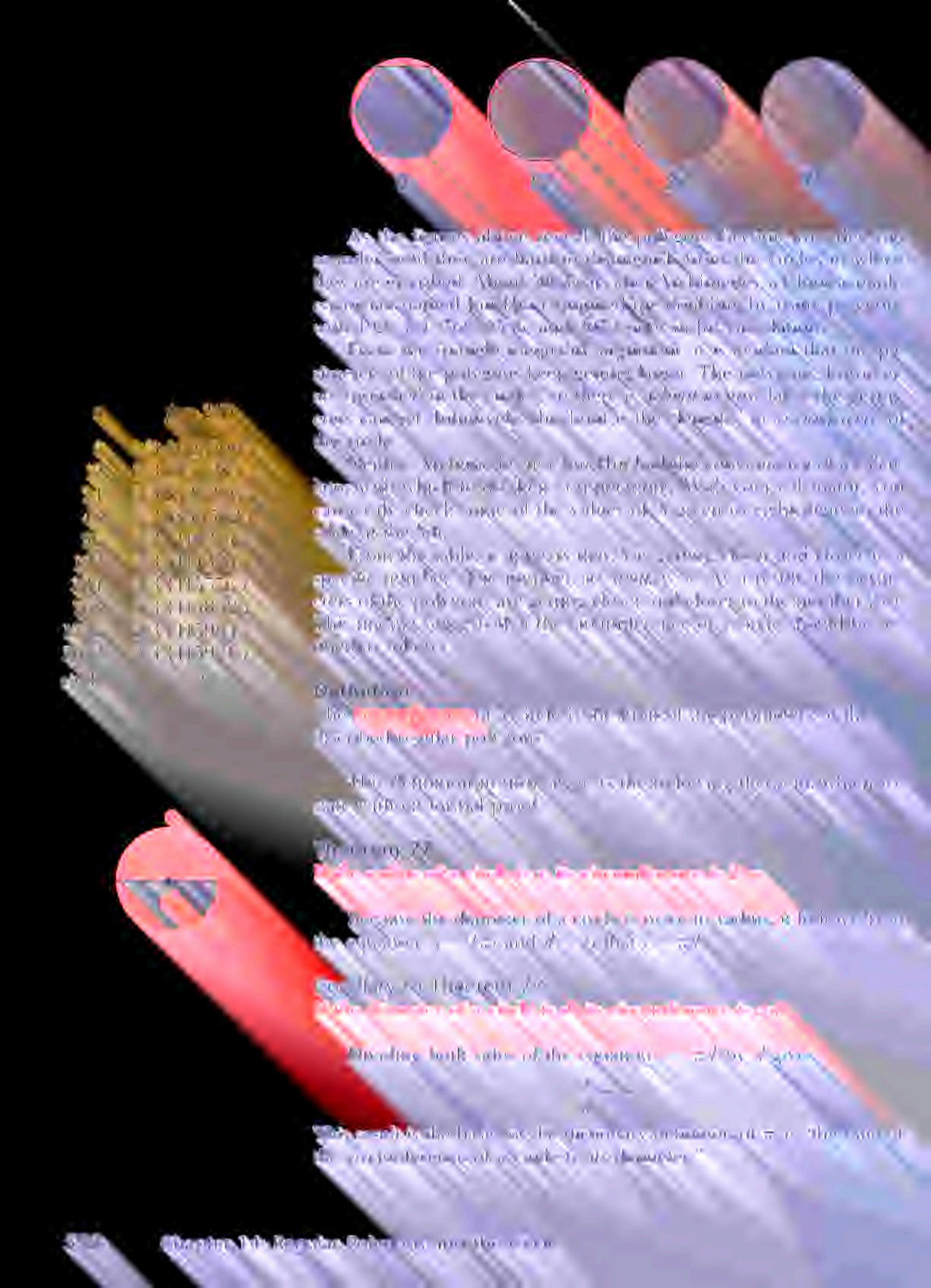

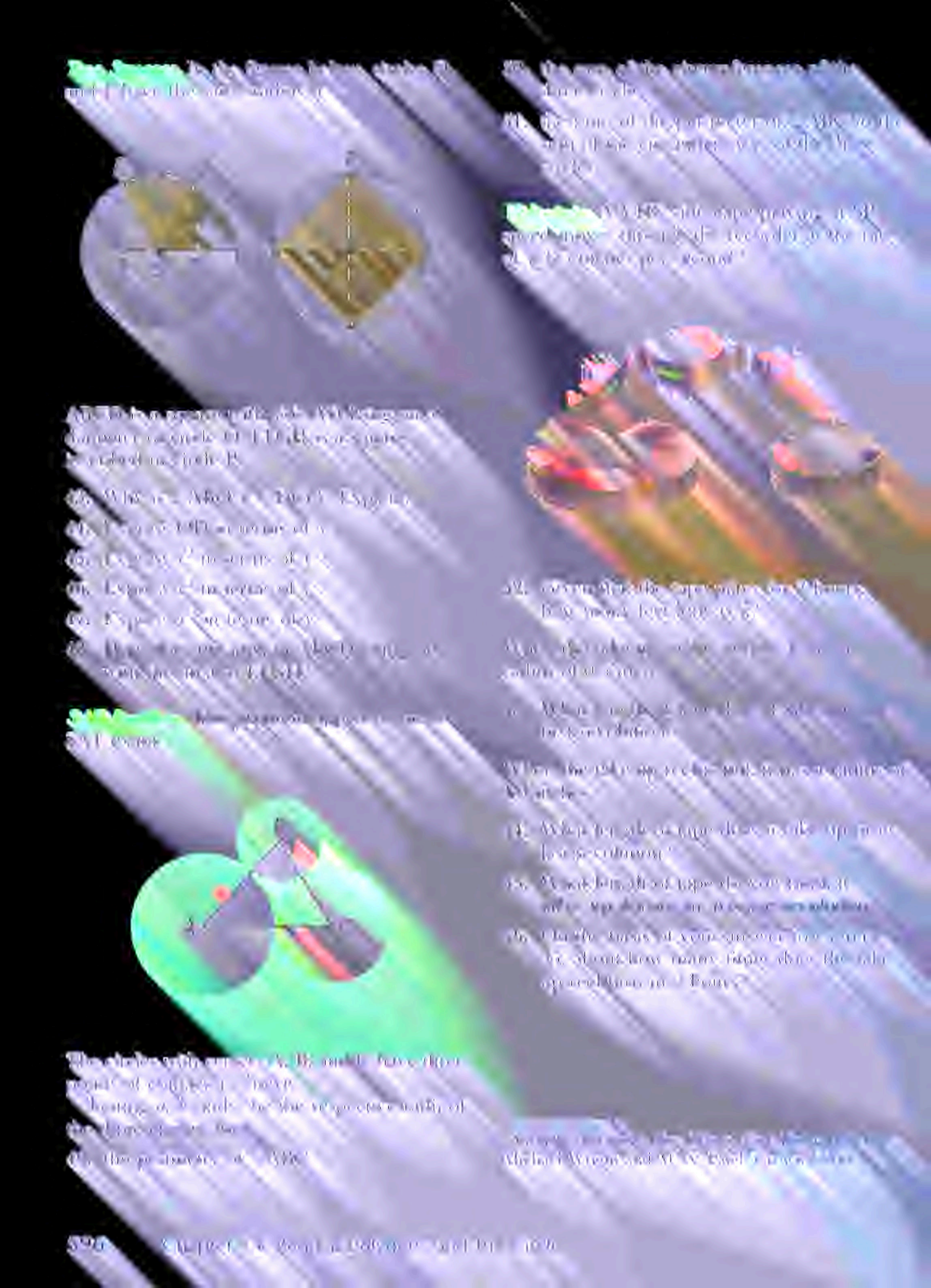











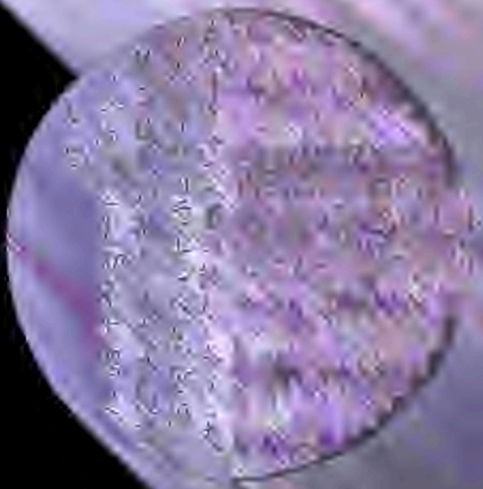

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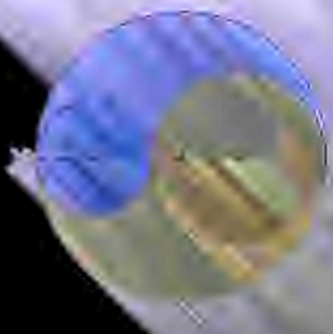

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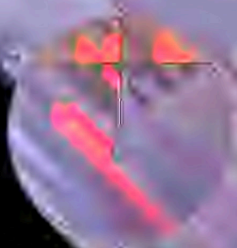



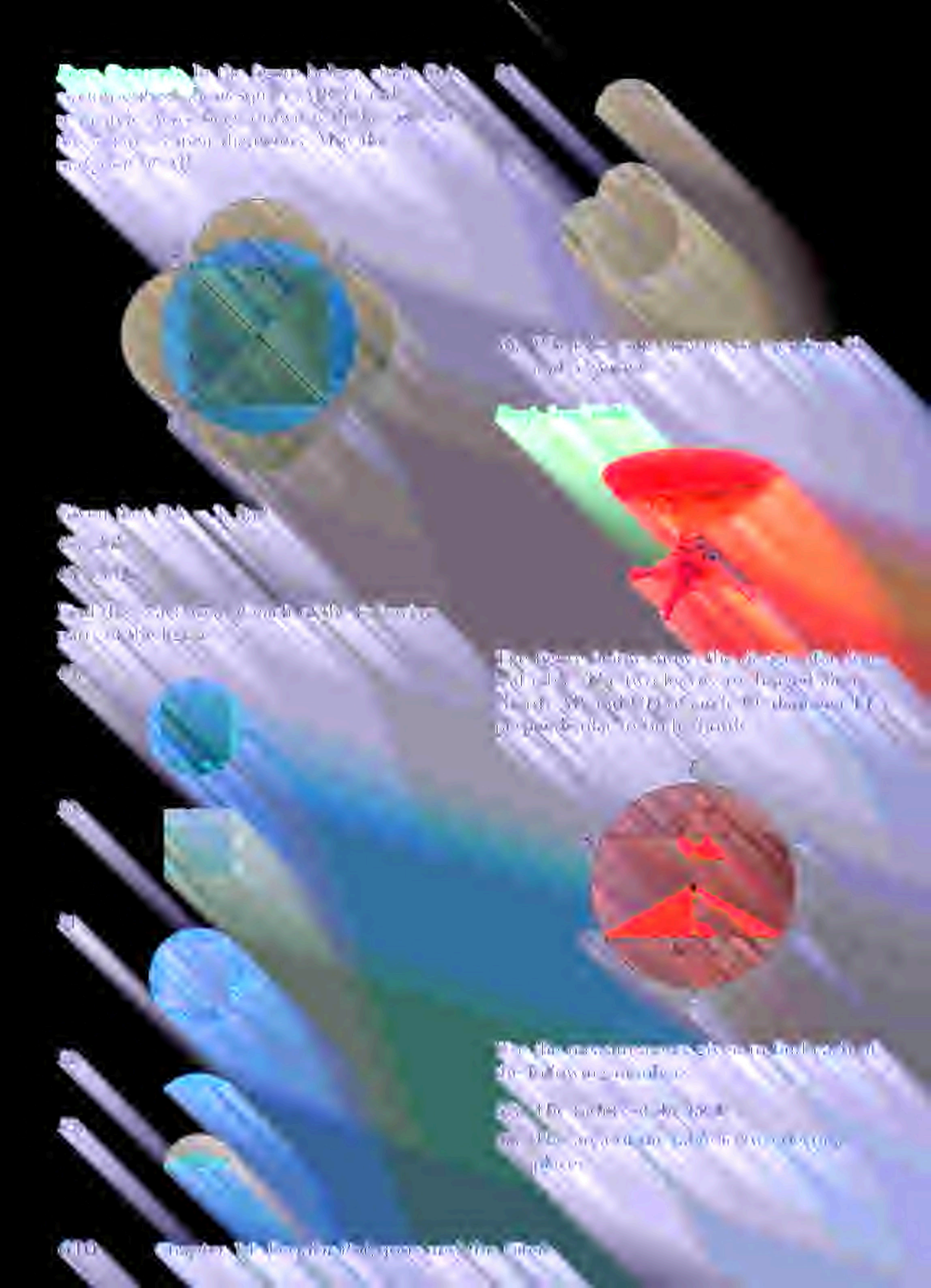

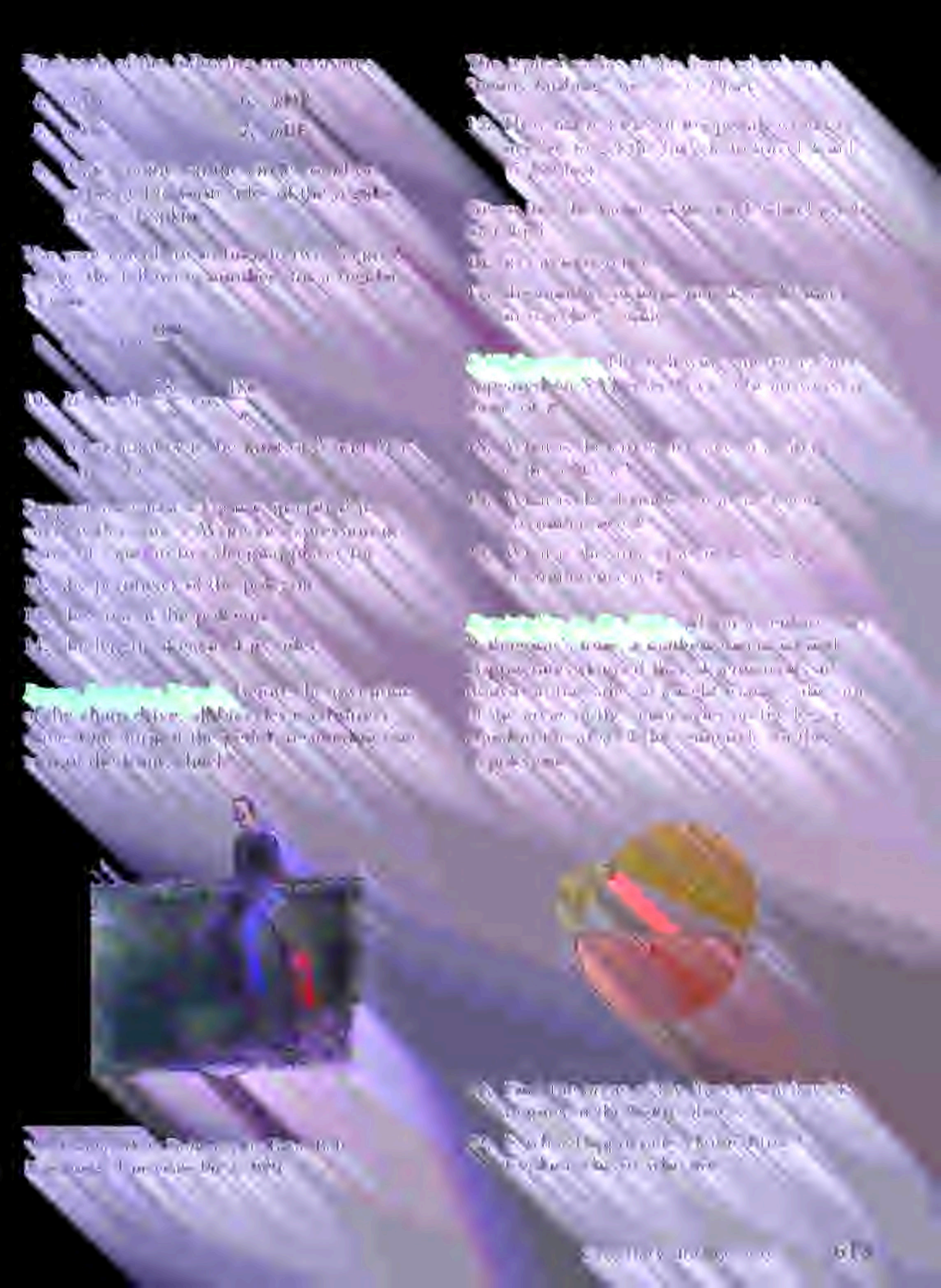





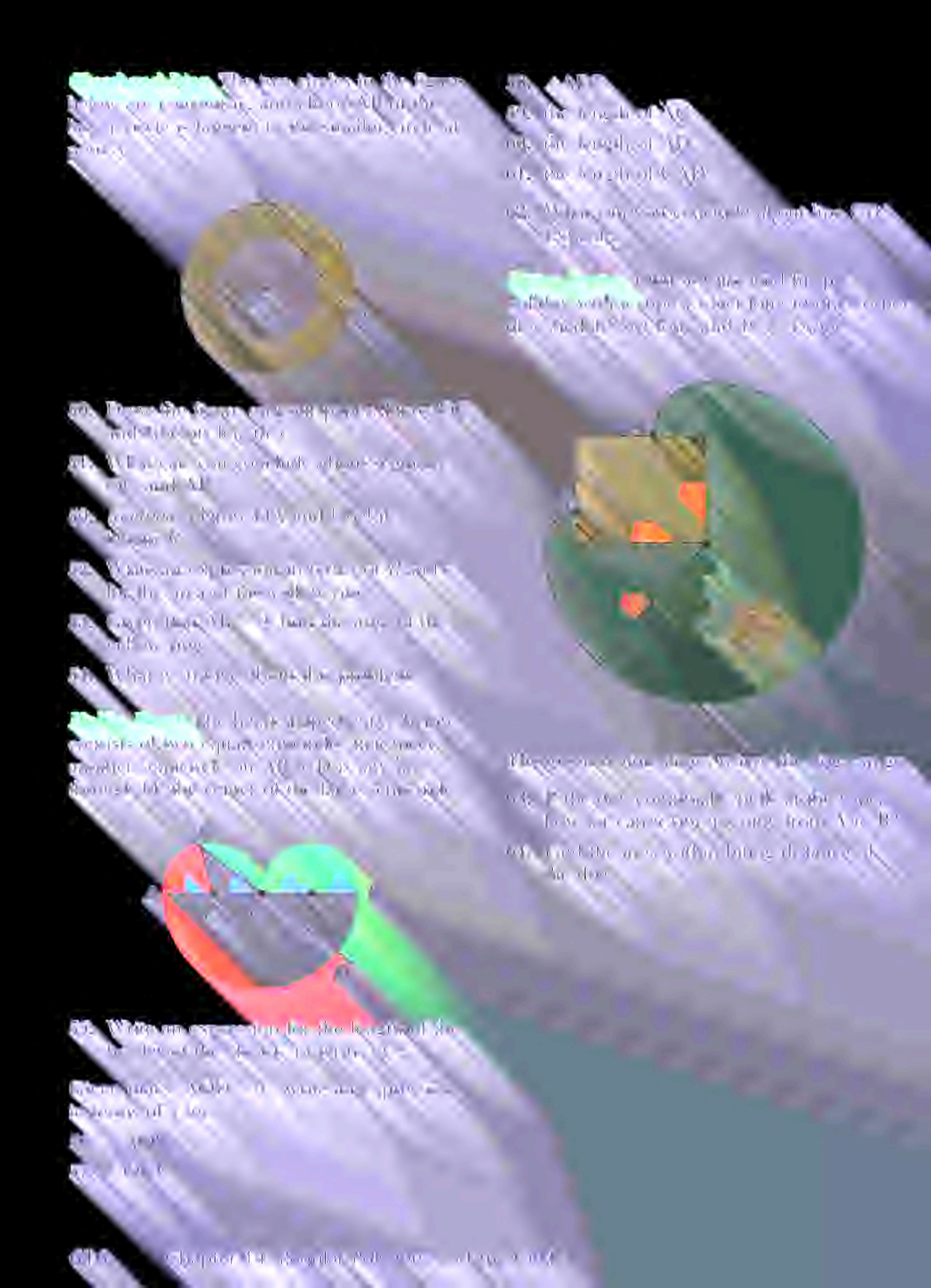

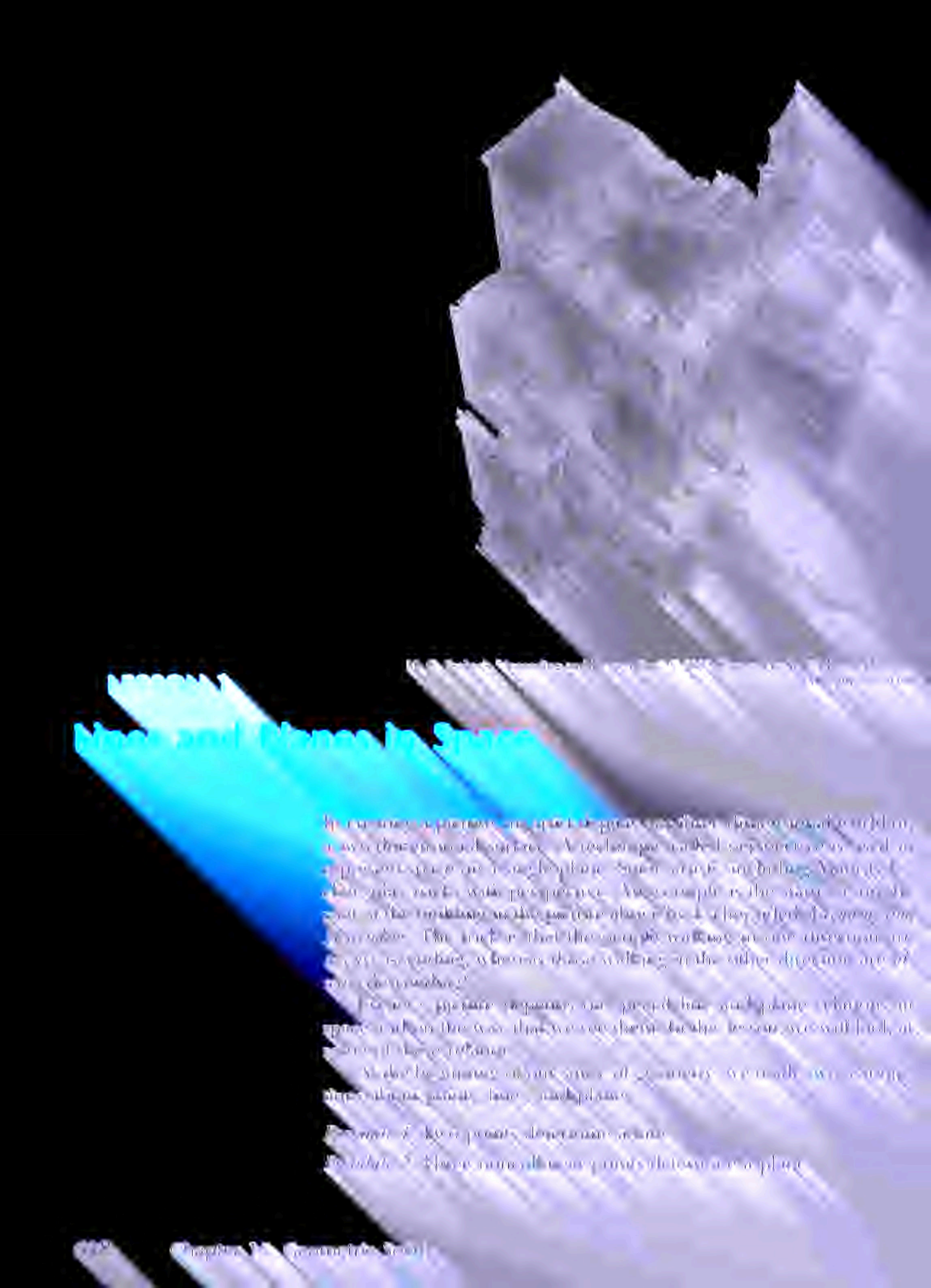



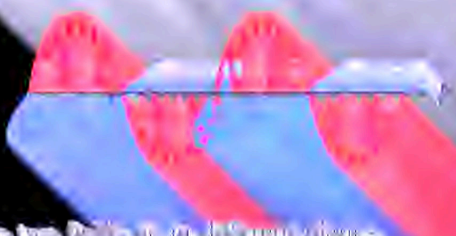





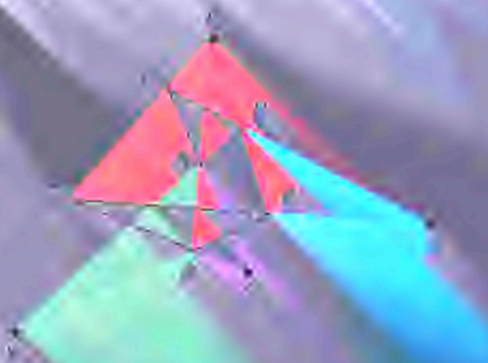



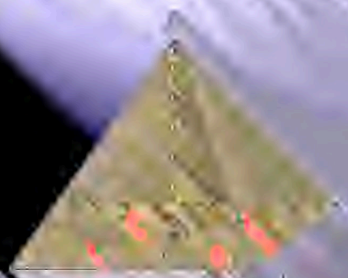










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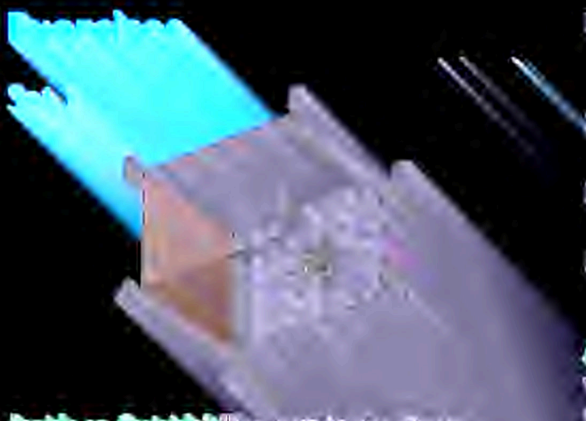
SVERIGE 50
SVERIGE 75















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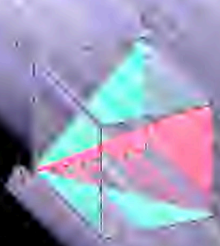

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[illegible] shown below is [illegible] rectangular base ABCD. [illegible] [illegible] along the [illegible] of each [illegible] the base.



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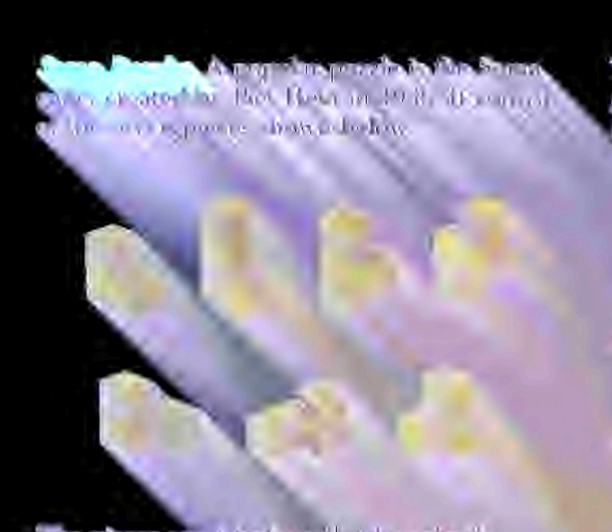



Polarity

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Definition

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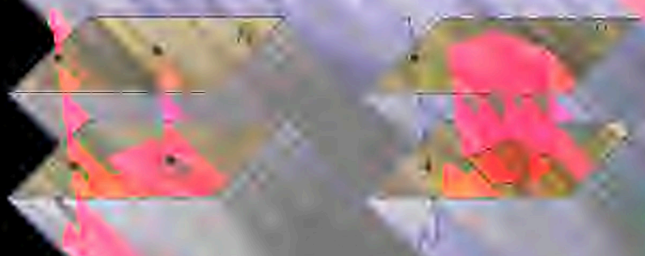





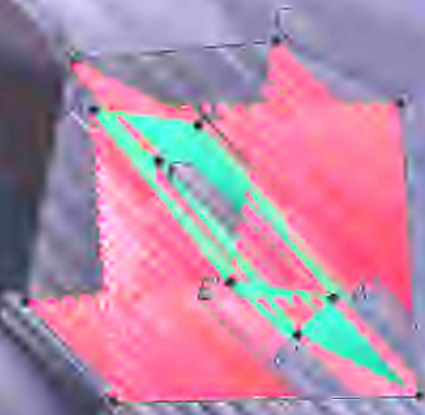
A
B
C
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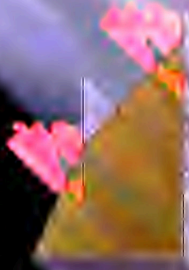
LEONHARD EULER 1707 - 1783











The Volume of a Prism

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Definition

[illegible]

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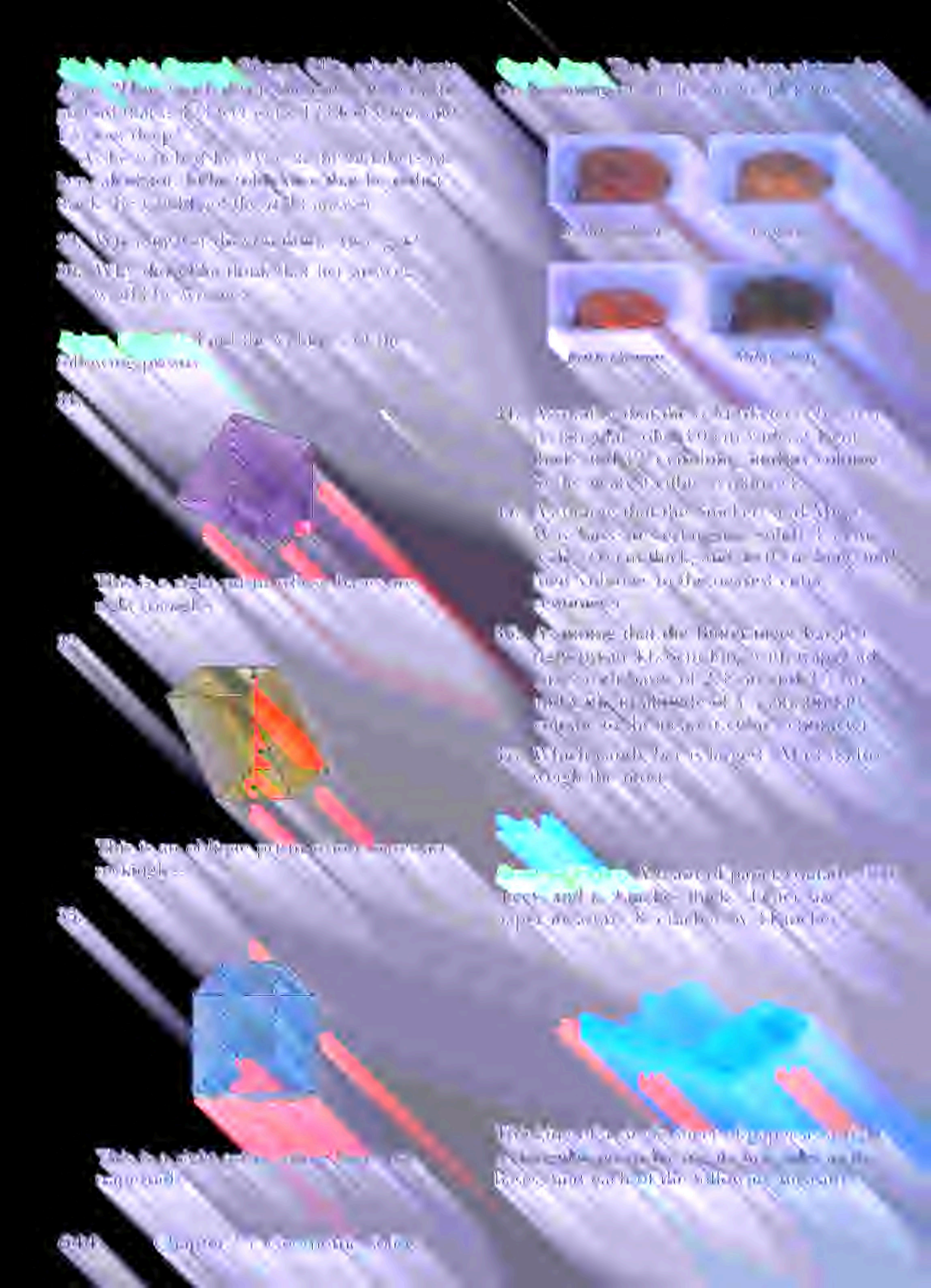











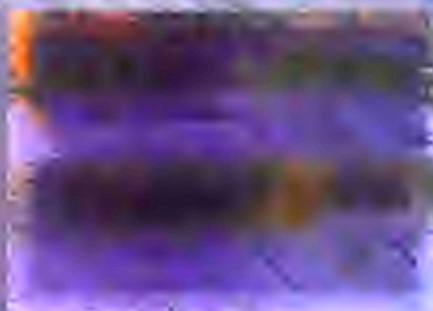

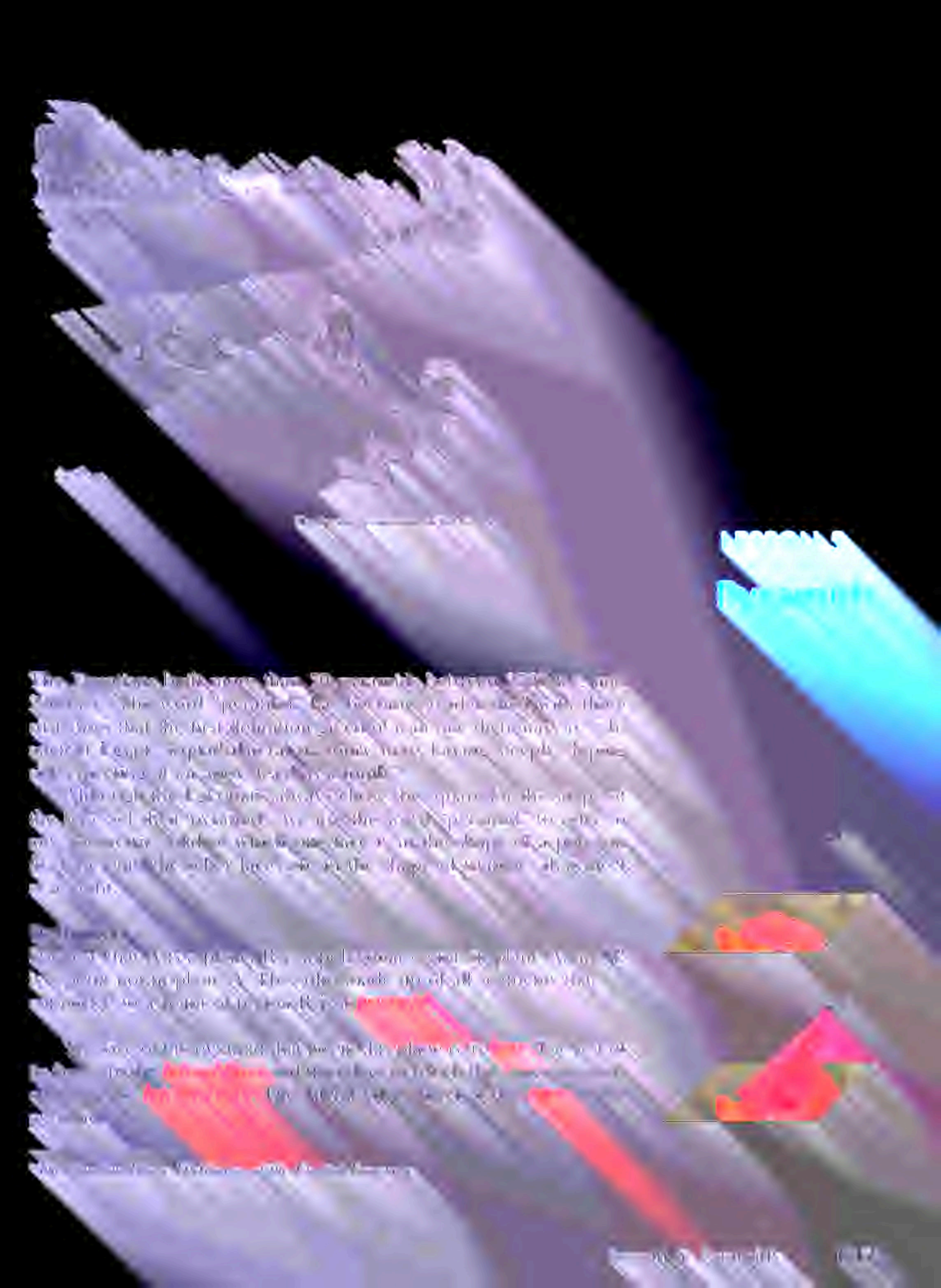

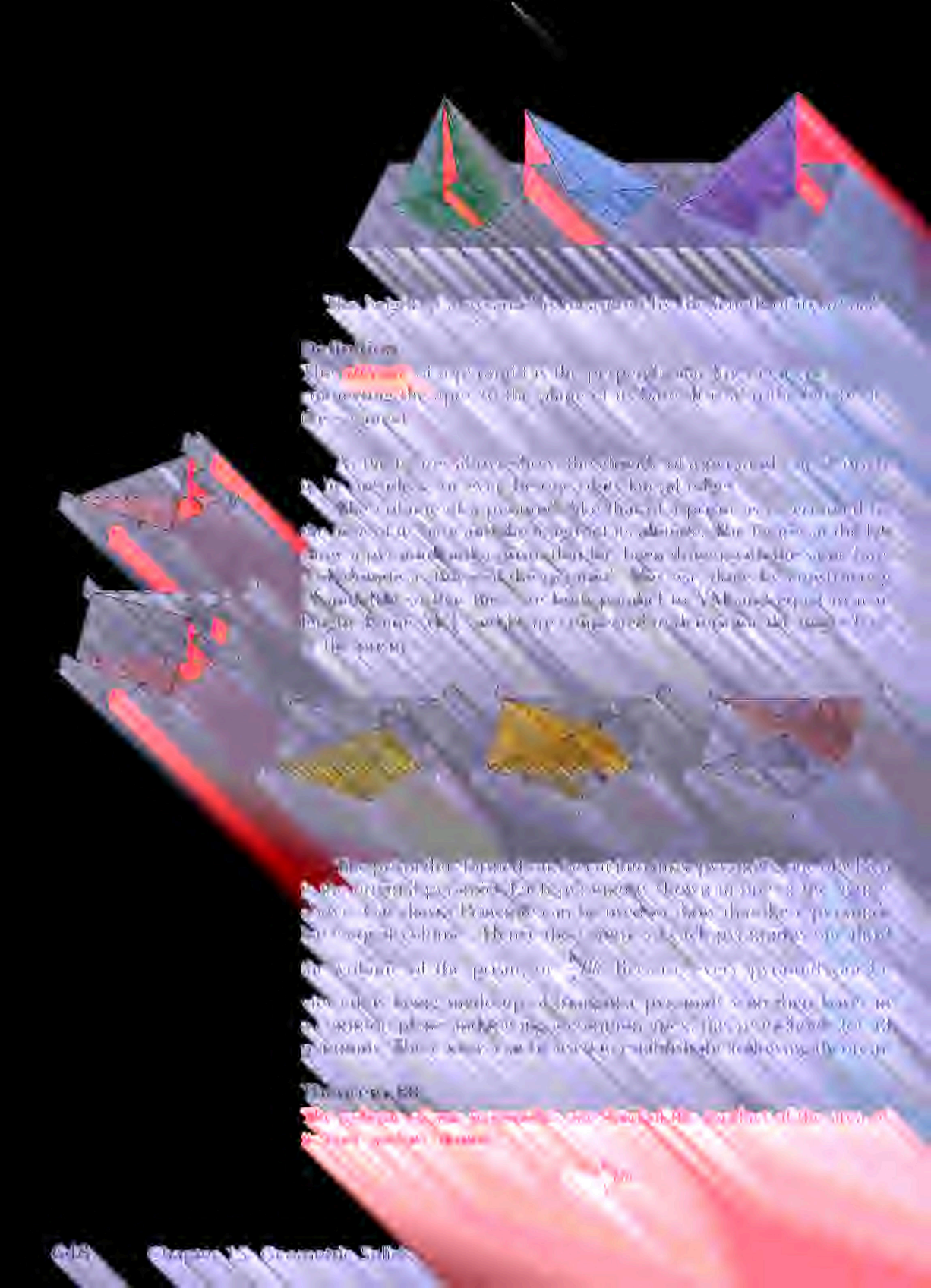









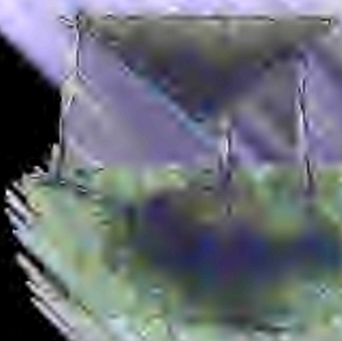









Cylinders and Cones

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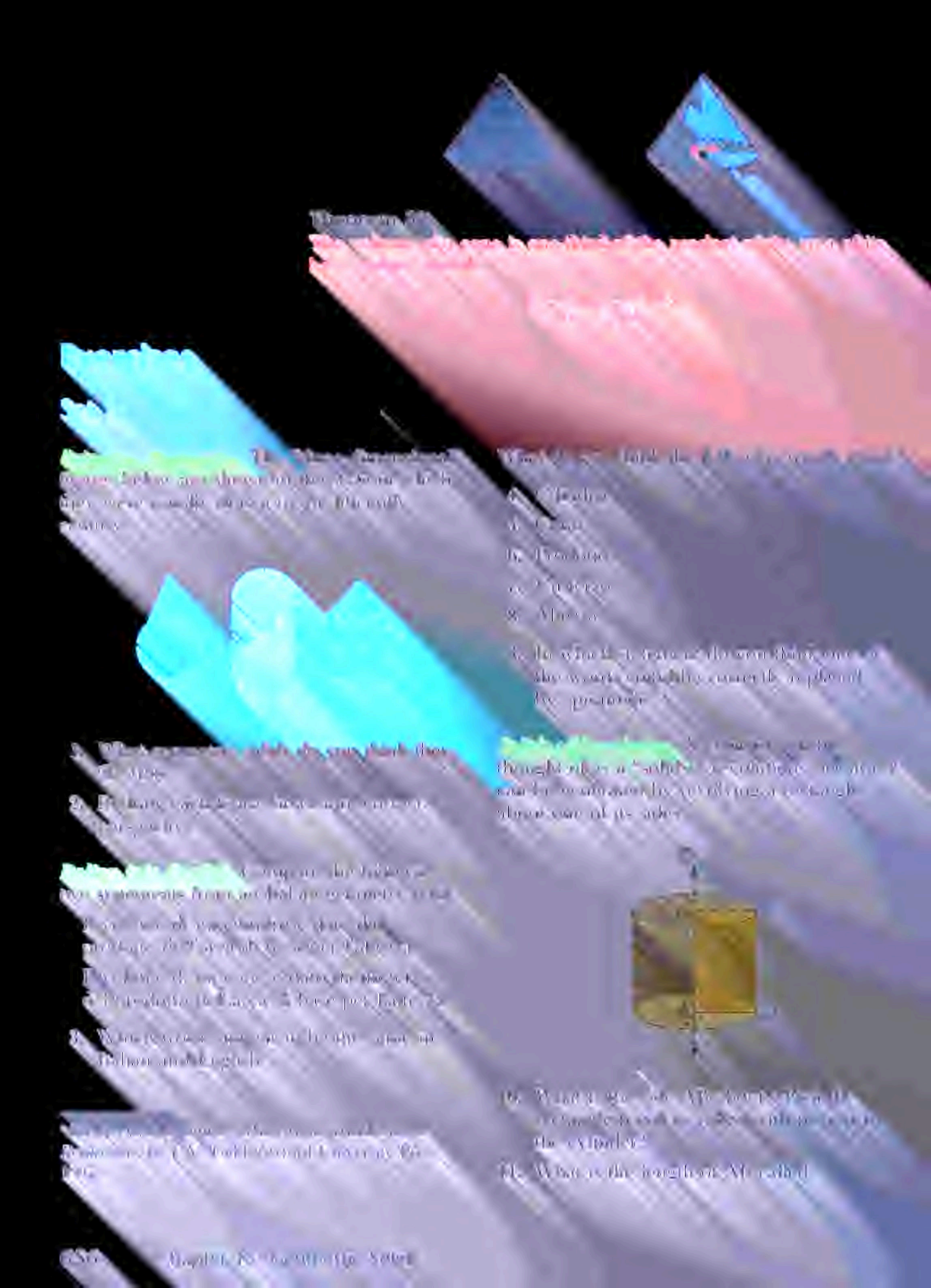
Definition

[illegible]









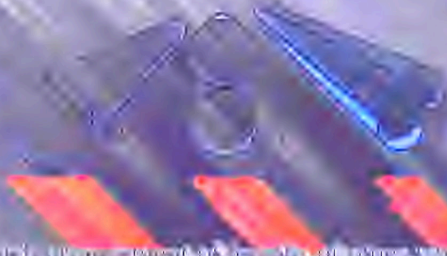








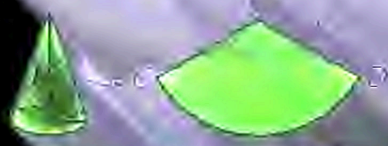








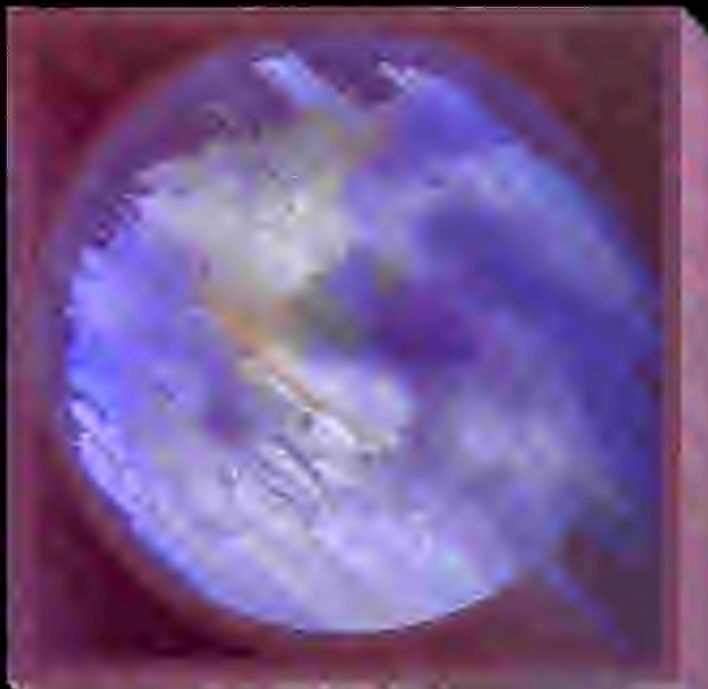












Spheres

Theorem 8.3





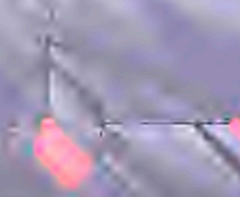




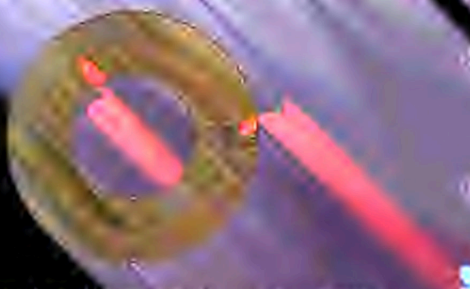






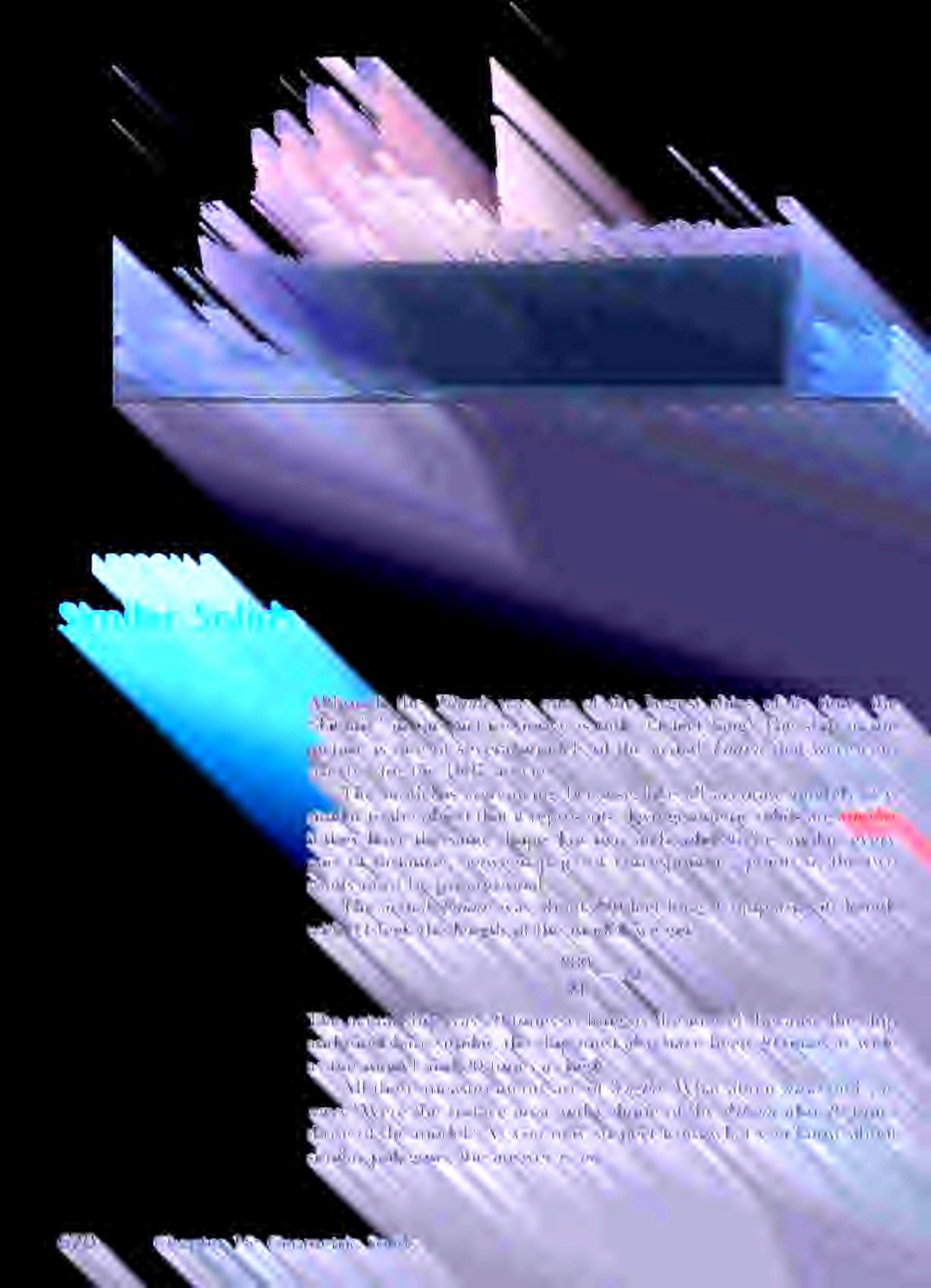














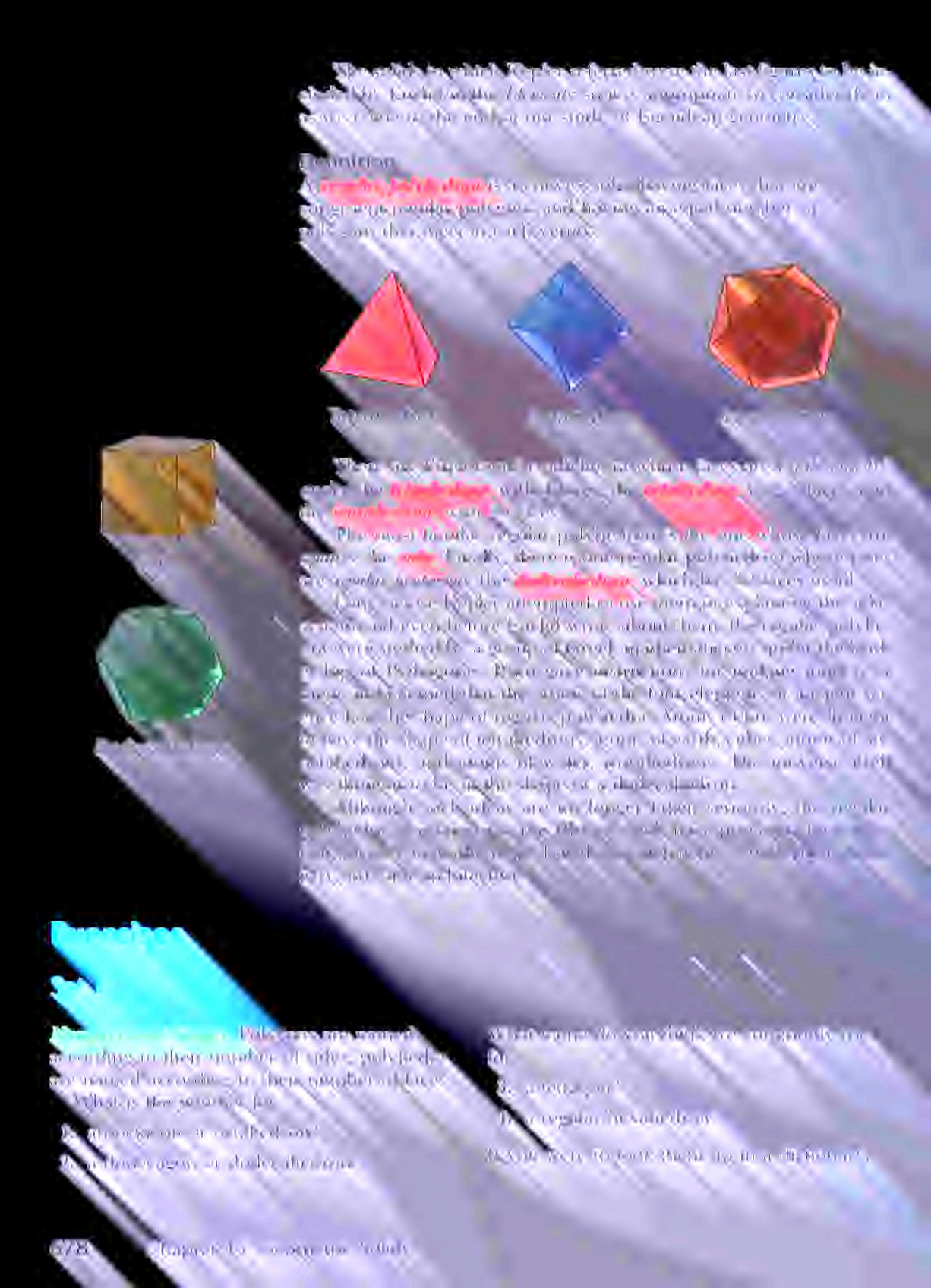








The Regular Polyhedra

















Summary and Review

Quick Notes

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Exercises

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Problems

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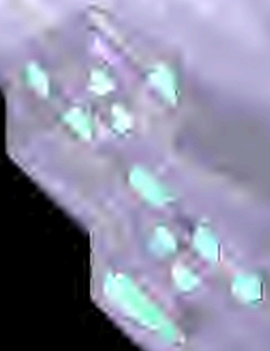
Exercises

[illegible]

Problems

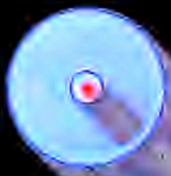
[illegible]

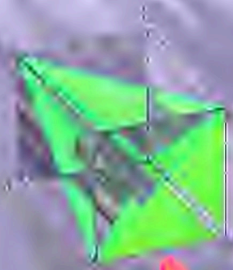








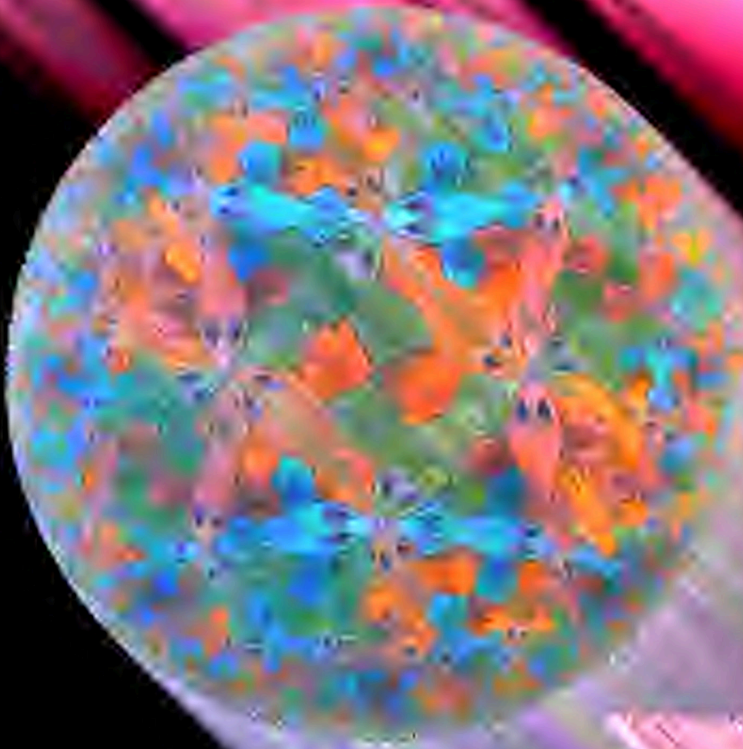


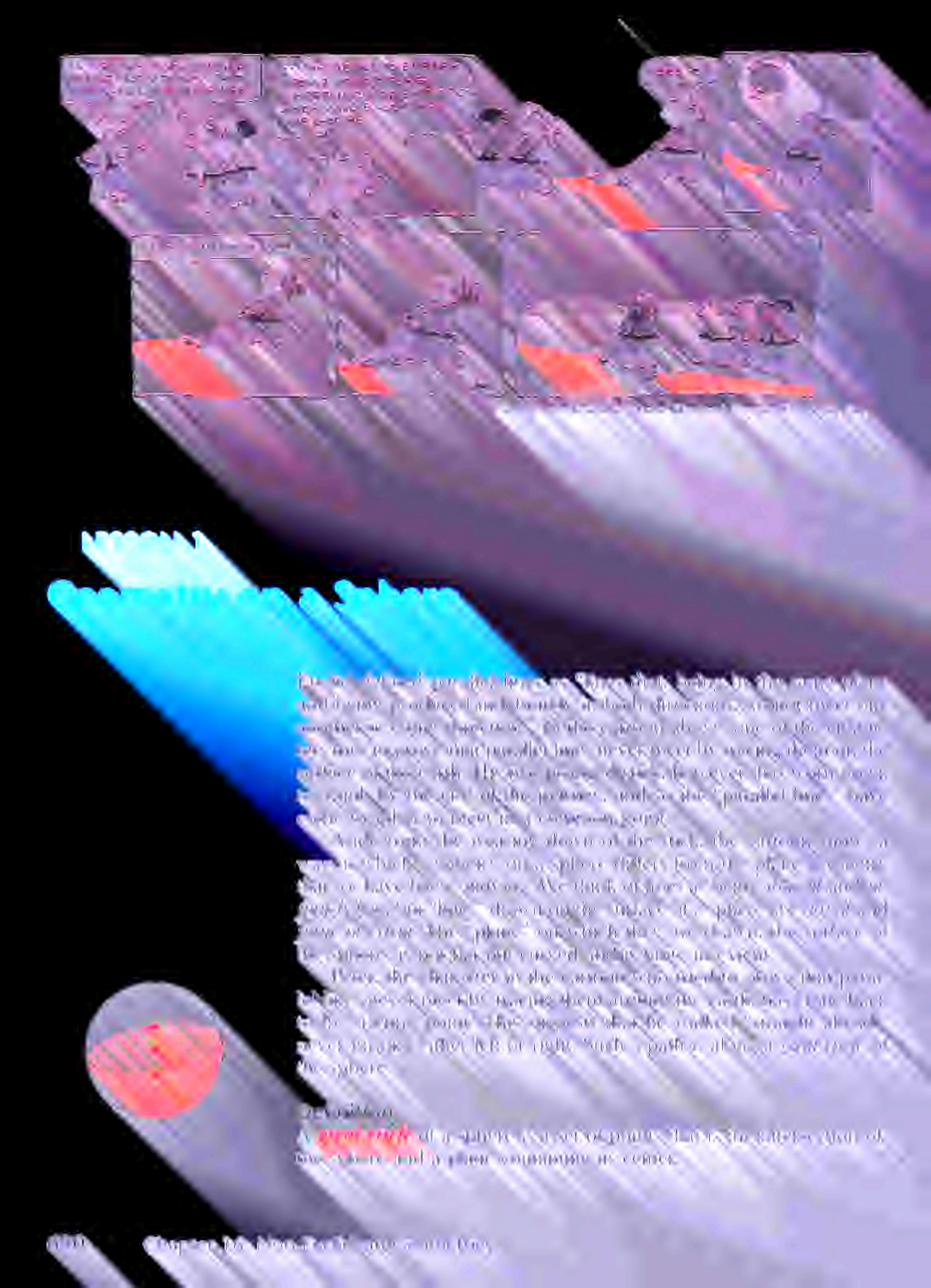




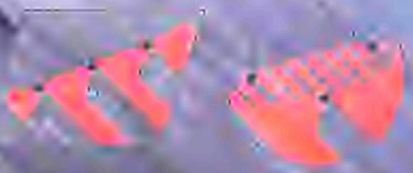


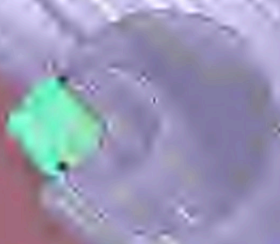


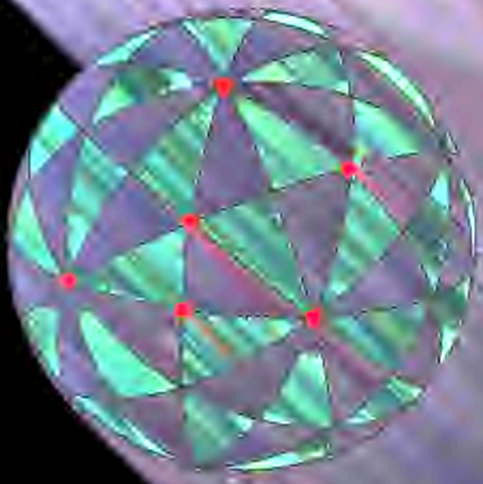








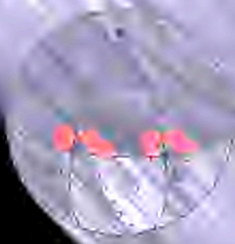






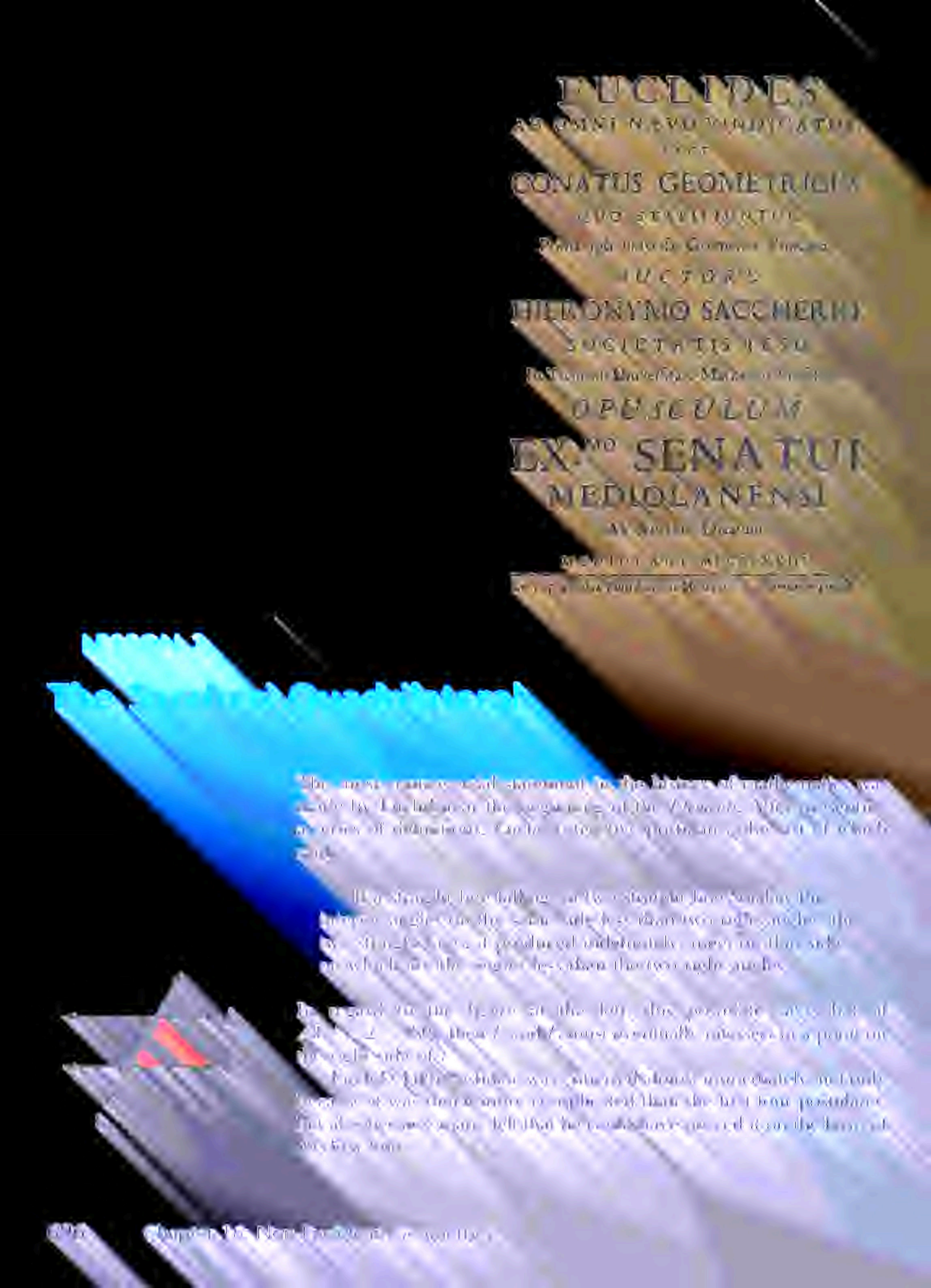











EUCLIDES
CONATUS GEOMETRICUS
HIERONYMO SACCHERIO
OPUSCULUM
MEDIOLANENSI

Theorem 37

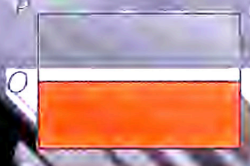
Theorem 38

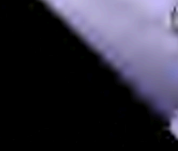
Theorem 39

Theorem 40

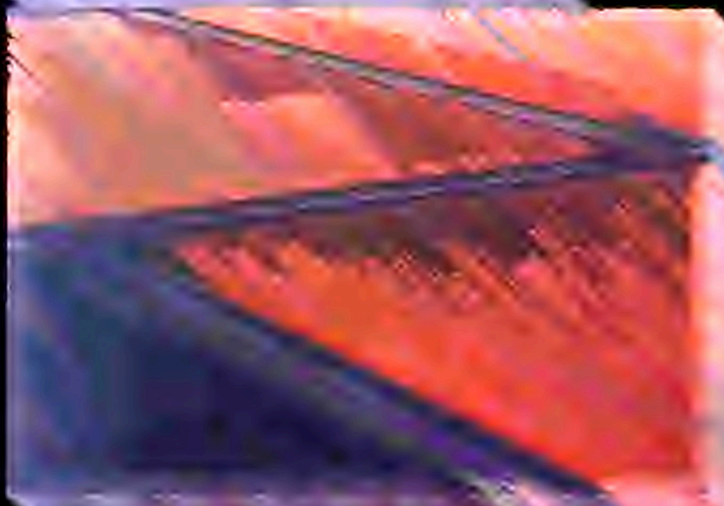
















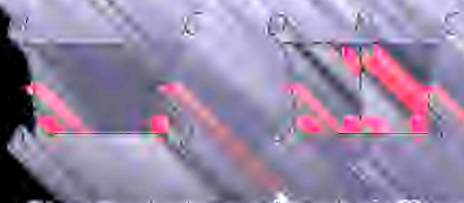
Proofs

We restate the proofs in the textbook in the same order as they appear in the textbook, with the parallel postulate in the general form. For the reader's convenience, we also reproduce the relevant figures in the text.

Book I

Euclid's proofs of the theorems of Book I rely on the following axioms. Some of these axioms are implicit in the proofs, while others are explicit. Euclid's axioms are the same as Hilbert's axioms.

Axiom 1 (Congruence). The segment AB is congruent to the segment CD if and only if the segment AB is congruent to the segment CD.



Given $\triangle ABC$ and $\triangle DEF$ with $AB = DE$, $BC = EF$, $\angle ABC = \angle DEF$.

Prove: $\triangle ABC \cong \triangle DEF$.

Proof:

Let $\triangle ABC$ be a triangle with $AB = AC$. Let D and E be points on AB and AC such that $AD = AE$. Let F and G be points on BC such that $BF = CG$.

1. $\triangle ABC$ and $\triangle ACB$ are congruent. (SAS)
2. $\angle ABC = \angle ACB$. (Why?)
3. $\angle ABC = \angle ACB$ and $BF = CG$. (Why?)

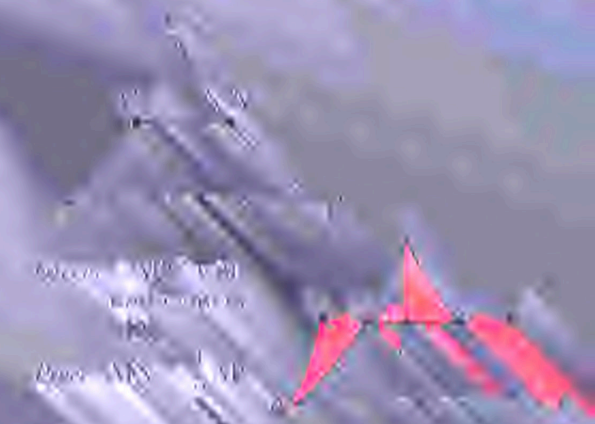
Let M and N be the midpoints of AB and AC as shown in the accompanying figure.

4. What points are on both AM and AN and why is this true?
5. What points are in triangle AMN?
6. $MN = \frac{1}{2}AB$ and $MN = \frac{1}{2}AC$. (Why?)
7. $AMND$ and $ANEC$ are parallelograms. (Why?)

We have proved that $DE = AN$ and $AN = BC$.

8. Just above that $DE = AN$ and $AN = BC$. (Why?)
9. $DE = \frac{1}{2}BC = AN = \frac{1}{2}BC$. (Why?)
10. $DE = AN$. (Why?)

Exercise 1 (Triangle Inequality). A triangle is a triangle in which the sum of any two sides is greater than the third side.



Given: $\triangle ABC$ with AB, BC, and AC as sides.

Prove: $AB + AC > BC$.

Proof:

Let $\triangle ABC$ be a triangle with AB, BC, and AC as sides. Let D be the point on AB such that $AD = AC$. Let E be the point on AC such that $AE = AB$.

1. $\triangle ADC$ and $\triangle ABE$ are isosceles triangles. (Why?)
2. $\angle ADC = \angle ACD$ and $\angle ABE = \angle AEB$. (Why?)
3. $\angle ADC = \angle ABE$. (Why?)

Let $AQED$ be a parallelogram. (Why?)

4. $AD = EQ$. (Why?)

Let $AD = EQ = AE = AB$. (Why?)

5. $AB = EQ$. (Why?)
6. $AB = BE$. (Why?)

Let F be the point on BC such that $BF = BE$ and $FC = FQ$.

7. $AQEB$ is a parallelogram. (Why?)
8. $AB = DE$. (Why?)

Let us use $DE = DAB$, $MP = PA = NE$, $MP = DM$, and $PA = PN$ to show that $DE = MP + MP + PA + PN = 2MP + 2PN$ and $MP = PN$.

9. $DE = 2MN$. (Why?)
10. $AB = 2MN$. (Why?)
11. $\frac{1}{2}AB = MN$, so $MN = \frac{1}{2}AB$. (Why?)

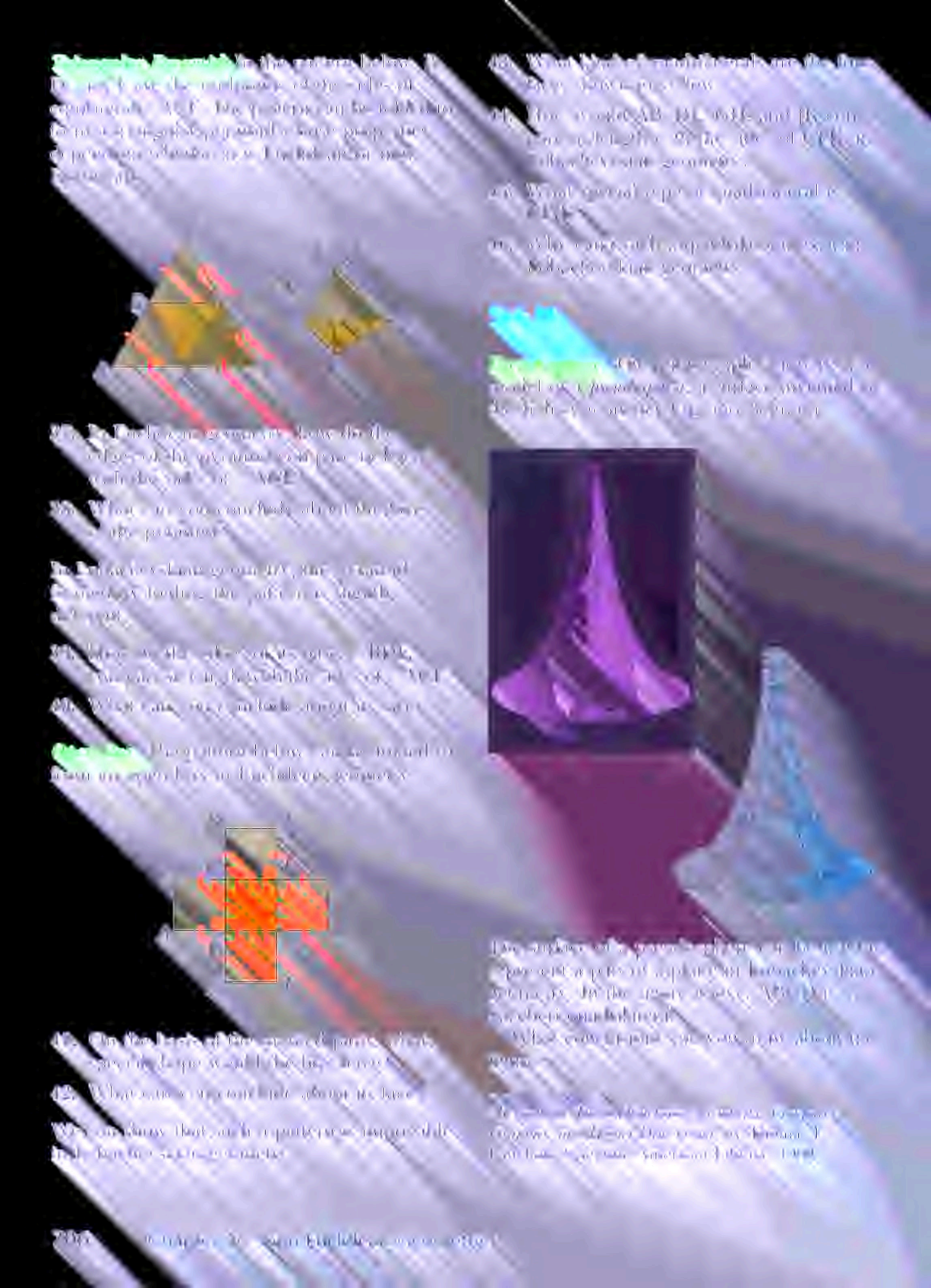
This stamp



[illegible]

[illegible]

[illegible]



[illegible]

[illegible]

Introduction Theorem 3

[illegible]

Corollary to Introduction Theorem 3

[illegible]

Introduction Theorem 4

[illegible]

[illegible]

> [illegible]

[illegible]









In both Euclidean geometry and Hyperbolic geometry, what can you conclude about:

39. $\angle DBE$ and $\angle ABC$? Explain.

40. the lengths of BE and BC?

41. $\angle E$?

42. $\angle$ and $\angle$ and $\angle EDC$?

In both Euclidean geometry, what can you conclude about:

43. $\angle EDC$?

44. The lengths of DE and EC? Explain.

45. DC and $\angle BC$?

46. DE and $\angle BC$?

47. The lengths of CE and ED?

48. The lengths of CE and AC?

49. AC and $\angle AC$?

50. How do the sides of $\angle ADE$ compare in $\angle$ with the corresponding sides of $\angle ABC$ in Euclidean geometry?

Set II

Astronomical Triangle. In 1829, Lobachevsky expressed that he used some astronomical measurements to find the sum of the angles of the triangle determined by Earth, the sun, and the star Sirius. He found that the sum of the angles of the triangle is approximately 0.000 [illegible]

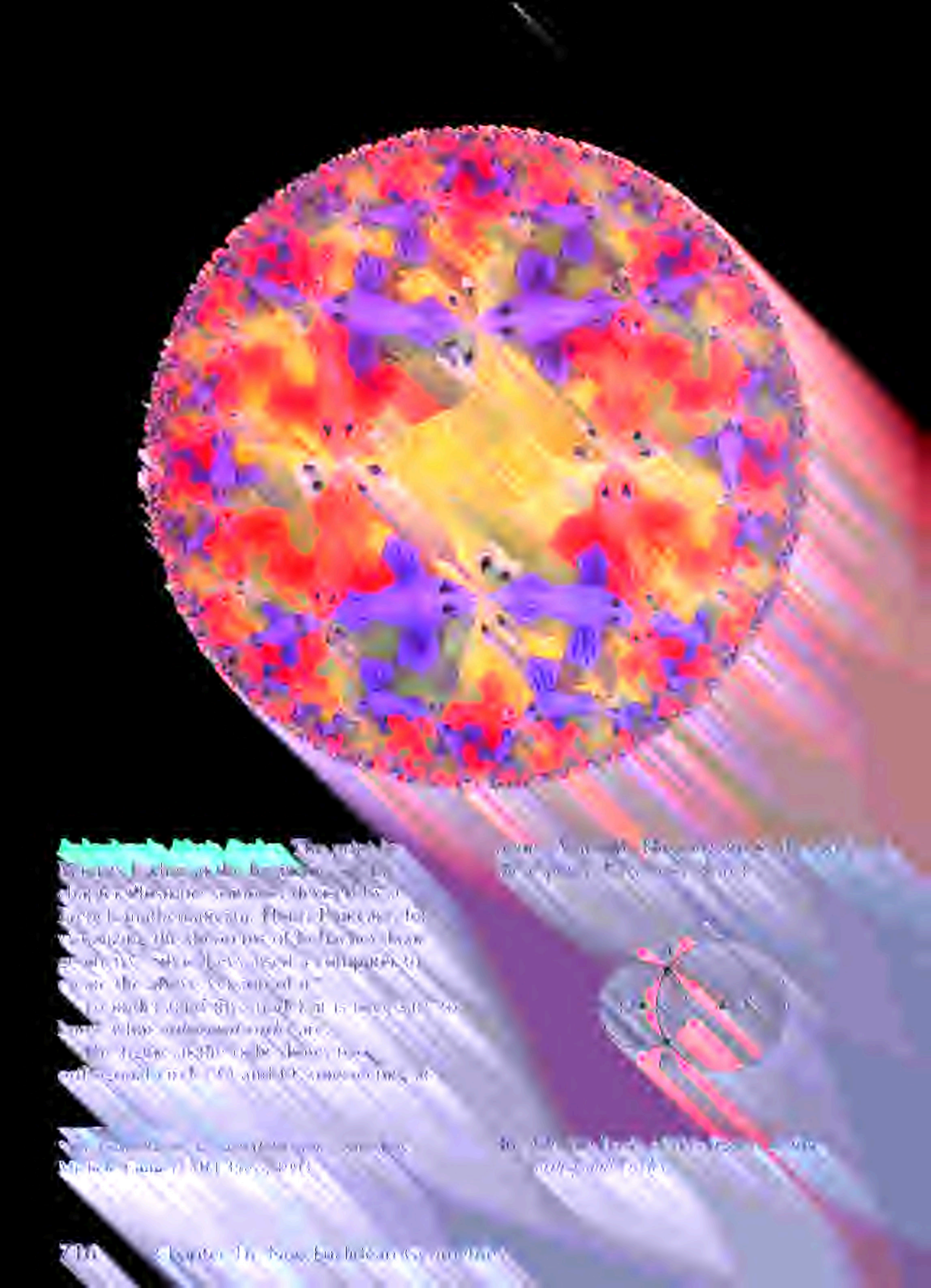
1. Do a Lobachevsky's [illegible] prove that the physical space is an Euclidean? Explain why or why not.
2. Would it be easier to prove the [illegible] physical space is Euclidean [illegible] Euclidean? Explain.




A
B









Final Review

Section 1: The Basics of Solid Geometry

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[illegible]

[illegible]

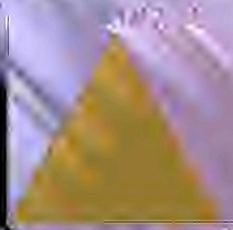












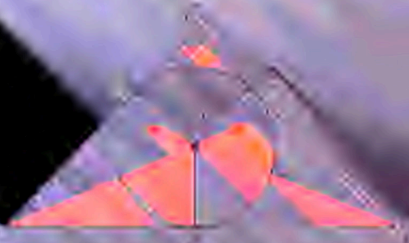


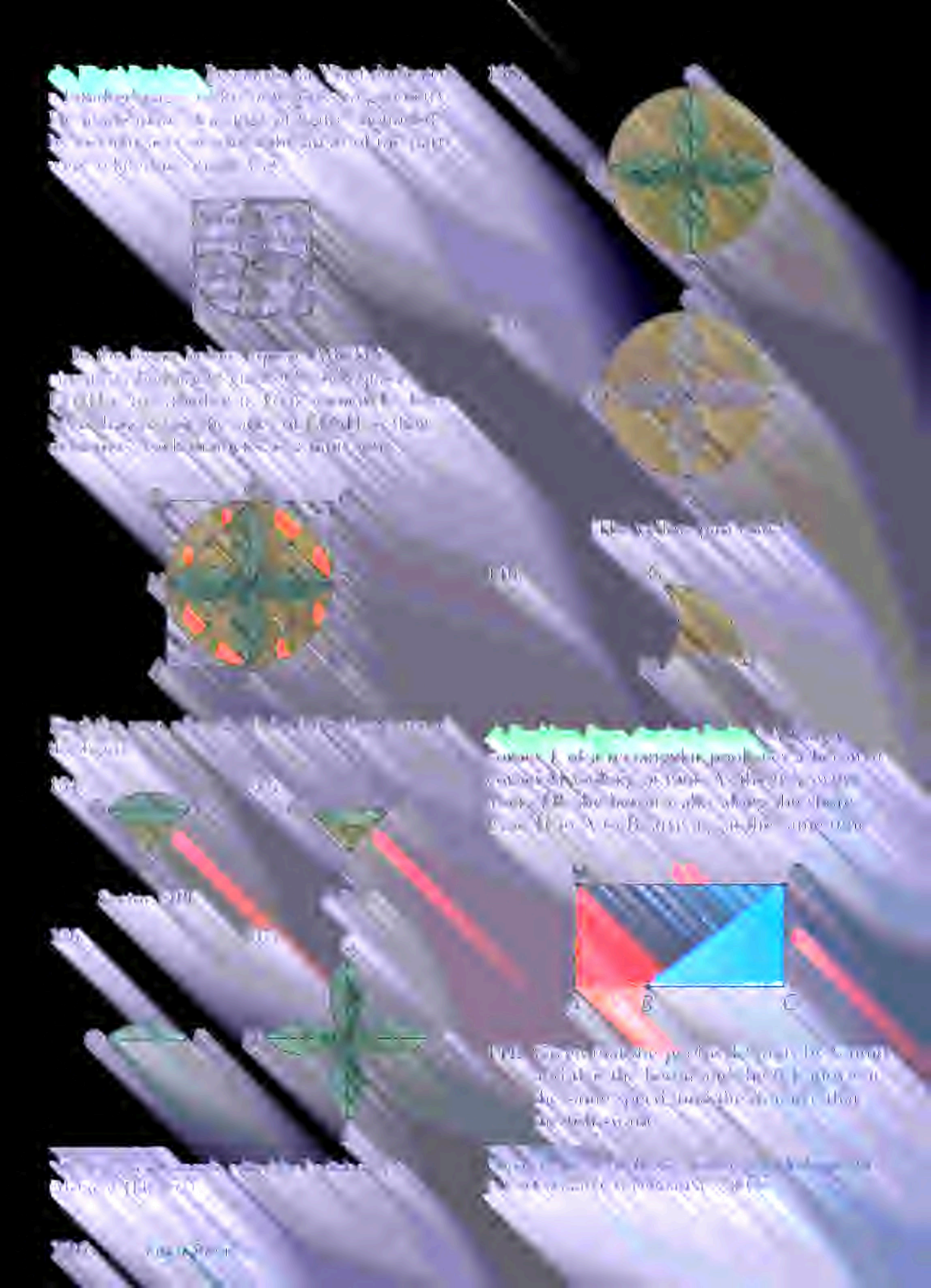
















Glossary

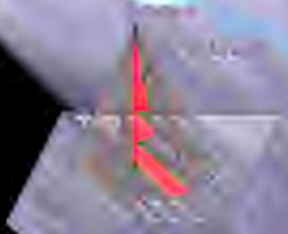
Acute angle: An angle that measures between 0° and 90°.

Acute triangle: A triangle with three acute angles.

Adjacent angles: Two angles that share a common vertex and a common side, but do not overlap.

Altitude of a prism: The perpendicular distance between the bases of a prism. The length of a segment perpendicular to the bases of a prism with endpoints on each base.

Altitude of a pyramid: The perpendicular distance from the apex to the plane of the base. The length of a segment perpendicular to the base of a pyramid with endpoints at the apex and on the plane of the base.



Altitude of a quadrilateral: The perpendicular distance between two parallel sides of a quadrilateral. The length of a segment perpendicular to two parallel sides of a quadrilateral with endpoints on each of the two parallel sides.

Altitude of a triangle: The perpendicular distance from a vertex of a triangle to the line containing the opposite side. The length of a segment perpendicular to a line containing the opposite side of a triangle with one endpoint at the vertex.

Angle: A figure formed by two rays with the same endpoint. The angle is the amount of rotation about the endpoint needed to map one of the rays onto the other ray. The angle can be named by the endpoint or by three points, with the endpoint in the middle.



Angle of elevation: The angle that is formed by a line of sight above the horizontal.

Antipodal points: The two points at which a diameter of a sphere intersects the sphere.

Apothem of a regular polygon: A segment from the center of a regular polygon to the midpoint of a side of the polygon. The length of such a segment.



Arc: An unbroken part of a circle consisting of two points on the circle and all of the points on the circle between them. The two points are called endpoints. If the endpoints are not diametrically opposite, they determine two arcs. The arc that is shorter is called the minor arc and the arc that is longer is called the major arc. Unless otherwise specified, an arc is assumed to be a minor arc. The endpoints of a major arc are the endpoints of the minor arc with the same endpoints.

Area of a region: The number of square units needed to cover a given two-dimensional region exactly. Informally, it can be thought of as the measure of how much space a two-dimensional figure occupies.



Arithmetic mean: The sum of a collection of numbers divided by the number of numbers in the collection. Also called the average.



Congruent figures: Informally, two figures [illegible]

Congruent triangles: [illegible]

Converse of a conditional statement: [illegible]

Convex polygon: [illegible]

Coplanar points: [illegible]

Corollary: [illegible]

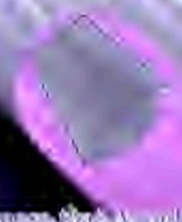
Cosine of an acute angle of a right triangle: [illegible]



Cross section of a geometric solid: [illegible]

Cube: [illegible]

Cyclic polygon: A polygon for which [illegible]



Cylinder: [illegible]



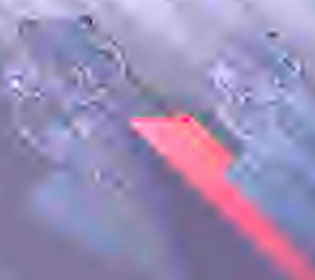
Decagon: [illegible]

Degree measure of an arc: [illegible]

Diagonal of a polygon: [illegible]

Diameter of a circle: [illegible]

Dilation: [illegible]





Parallelogram A quadrilateral with 2 pairs of parallel sides

Perimeter The distance around the outside of a shape

Perimeter of a polygon The sum of the lengths of the sides of a polygon

Perpendicular Lines or line segments that meet at a right angle

Perpendicular bisector of a line segment A line that is perpendicular to a line segment and passes through its midpoint

Perpendicular polygons Two polygons with corresponding sides that are perpendicular

Polygon A closed two-dimensional shape with straight sides that are line segments

Pyramid A three-dimensional shape with a polygon base and triangular faces that meet at a point

Pythagorean Theorem A relationship that says $a^2 + b^2 = c^2$ where a and b are the lengths of the legs of a right triangle and c is the length of the hypotenuse

Quadrilateral A polygon with 4 sides

Radius A line segment that connects the center of a circle to a point on the circle

Radius of a sphere The distance from the center of a sphere to any point on the sphere

Ray Part of a line that starts at a point and goes on forever in one direction

Rectangle A quadrilateral with 4 right angles

Rectangular prism A three-dimensional shape with 6 rectangular faces

Reflection A transformation that flips a figure over a line

Regular polygon A polygon with all sides the same length and all angles the same measure

Rhombus A quadrilateral with 4 sides of equal length

Right angle An angle that measures 90°

Right triangle A triangle that has a right angle

Scalene triangle A triangle that has no sides of equal length

Sector of a circle The region of the circle between two radii and the arc connecting their endpoints

Segment of a line Two points on a line and all the points between them

Segment of a circle The region between a chord and the arc with the same endpoints

Semicircle Half of a circle

Similar Two figures that have the same shape but not necessarily the same size

Similar polygons Two polygons with corresponding angles that have the same measure and corresponding sides that are proportional

Sphere The set of all points in space that are a fixed distance from a center point

Square A quadrilateral with 4 sides of equal length and 4 right angles

Surface area The sum of the areas of the faces of a three-dimensional figure

Symmetry A figure has symmetry if it can be reflected, rotated, or translated onto itself

Translation A transformation that moves a figure without changing its size, shape, or orientation

Trapezoid A quadrilateral with exactly 1 pair of parallel sides

Triangle A polygon with 3 sides

Triangle inequality The sum of the lengths of any two sides of a triangle is greater than the length of the third side

Vertex of a polygon A point where 2 sides of a polygon meet

Vertex of a pyramid The point where the triangular faces of a pyramid meet

Volume The amount of space inside a three-dimensional figure

Volume of a rectangular prism The product of the length, width, and height of a rectangular prism

Rate: A [illegible] of polygons [illegible]

Rectangle: A [illegible] with [illegible] sides.

Reflection points: Points that [illegible]

Reflection and plane for two planes: A [illegible] the [illegible] perpendicular.

Right angle: An angle [illegible] 90 [illegible]

Right triangle: A triangle that has [illegible]

Rotation: A [illegible] that [illegible]

Rotation: A [illegible] that [illegible]



Opposite rays: [illegible]



Opposite side triangle: [illegible]

Parallel line and plane: A line and a plane [illegible]

Parallel lines: [illegible]

Parallel planes: [illegible]

Parallelogram: A [illegible]

Perimeter: [illegible]

Perpendicular: [illegible]



Perpendicular line and plane: [illegible]



Perpendicular line: [illegible]

Perpendicular planes: [illegible]

Plane: [illegible]

Polygon: [illegible]



Polygon Angles: The order of a polygon [illegible]



Polyhedron: A polyhedron [illegible]

Polygon: [illegible]



Polygon Angles: [illegible]

Polygon Angles: [illegible]

Polygon Angles: [illegible]

Quadrilateral: A polygon [illegible]

Radius of a circle: [illegible]

Radius of a regular polygon: [illegible]

Radius: [illegible]

Ray: [illegible]



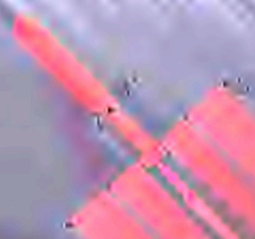
Rectangle: [illegible]

Rectangular solid: [illegible]



Reflection of a point: [illegible]





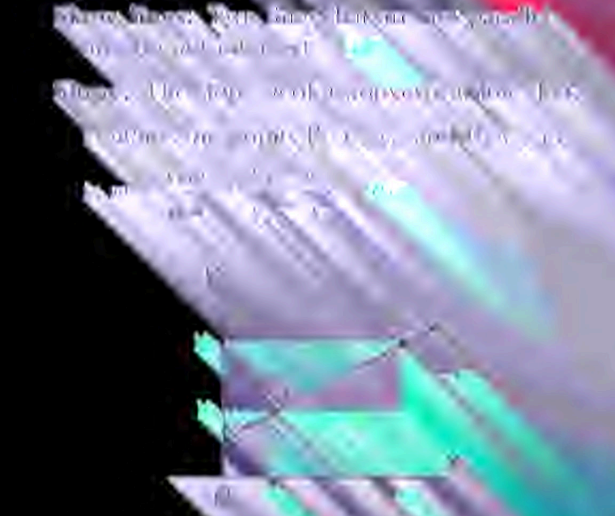
Reflection in the plane Given a plane $\mathcal{P}$ in space, the reflection in $\mathcal{P}$ is the transformation that sends each point P to the point P' such that $\mathcal{P}$ is the perpendicular bisector of the segment PP'.



Glide reflection Given a line ℓ in the plane and a nonzero vector $\vec{v}$ parallel to ℓ, the glide reflection with axis ℓ and vector $\vec{v}$ is the transformation that first reflects in ℓ and then translates by $\vec{v}$.



Glide rotation Given a line ℓ in space, a nonzero vector $\vec{v}$ parallel to ℓ, and a nonzero angle θ, the glide rotation with axis ℓ, vector $\vec{v}$, and angle θ is the transformation that first rotates by θ around ℓ and then translates by $\vec{v}$.



Glide reflection Given a plane $\mathcal{P}$, a line ℓ in $\mathcal{P}$, and a nonzero vector $\vec{v}$ parallel to ℓ, the glide reflection with plane $\mathcal{P}$, axis ℓ, and vector $\vec{v}$ is the transformation that first reflects in $\mathcal{P}$ and then translates by $\vec{v}$.

Symmetry The set of all points P such that P and P' are on opposite sides of $\mathcal{P}$ and the midpoint of PP' is on $\mathcal{P}$.

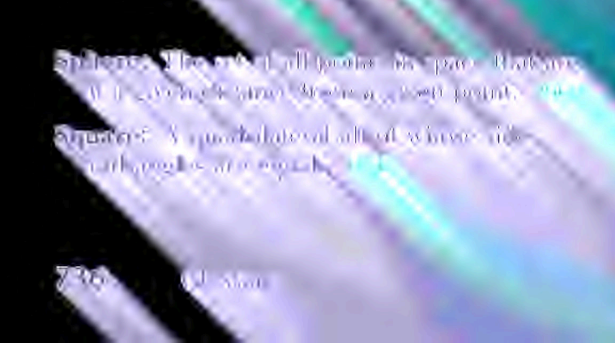
Symmetry A transformation of a figure that leaves the figure looking exactly the same.

Symmetry with respect to a line A transformation of a figure in the plane that leaves the figure looking exactly the same after reflecting the figure in a line ℓ. The line ℓ is called a line of symmetry of the figure.

Symmetry with respect to a point A transformation of a figure in the plane that leaves the figure looking exactly the same after rotating the figure by 180° around a point P. The point P is called a point of symmetry of the figure.

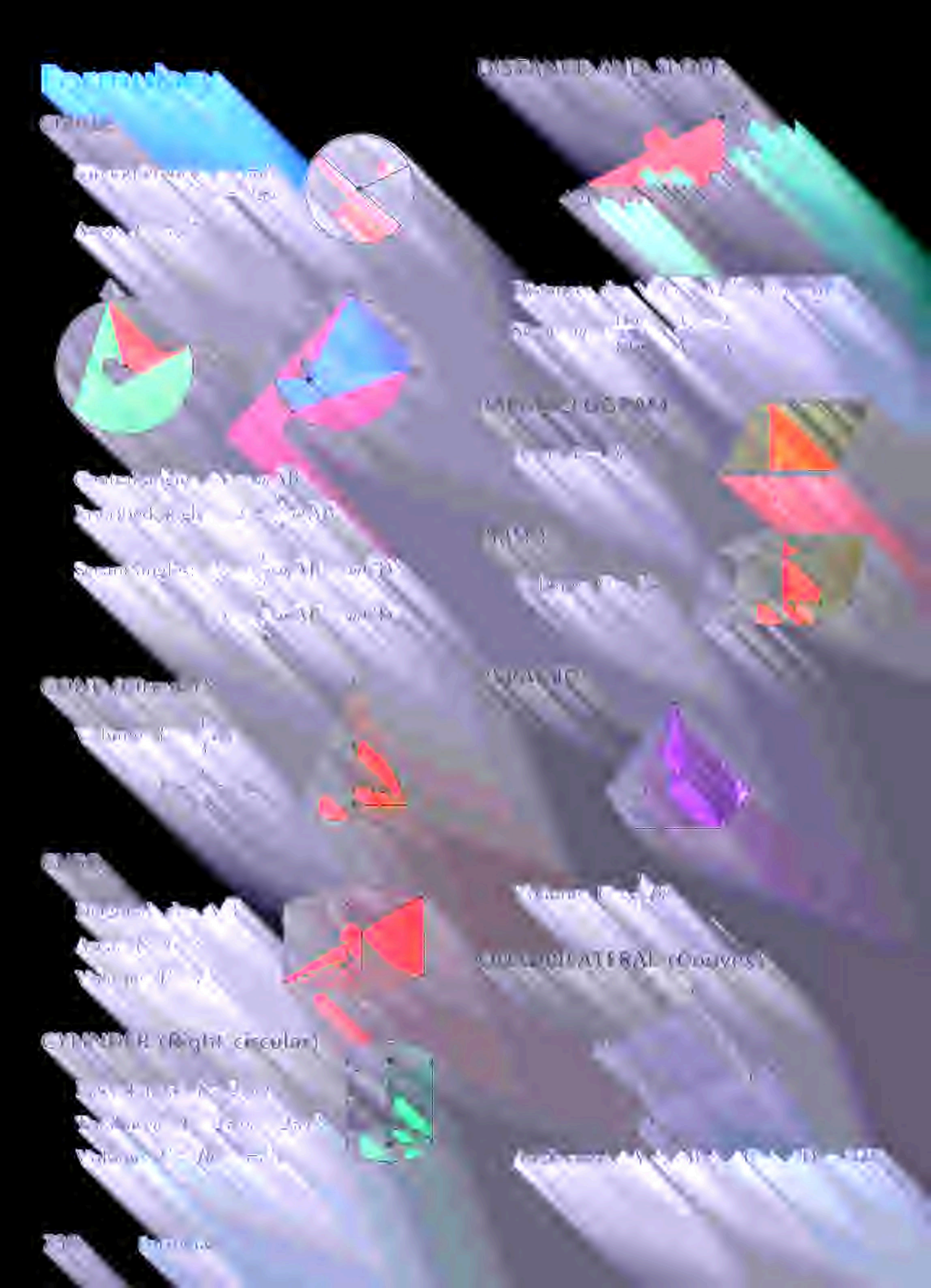
Symmetry with respect to a plane A transformation of a figure in space that leaves the figure looking exactly the same after reflecting the figure in a plane $\mathcal{P}$. The plane $\mathcal{P}$ is called a plane of symmetry of the figure.

Symmetry with respect to a line A transformation of a figure in space that leaves the figure looking exactly the same after rotating the figure by 180° around a line ℓ. The line ℓ is called a line of symmetry of the figure.



Rotational symmetry A transformation of a figure that leaves the figure looking exactly the same after rotating the figure by θ around a point P, where θ is between 0° and 360°. The point P is called a point of rotational symmetry of the figure.

Translational symmetry A transformation of a figure that leaves the figure looking exactly the same after translating the figure by $\vec{v}$, where $\vec{v}$ is a nonzero vector. The vector $\vec{v}$ is called a vector of translational symmetry of the figure.





TRAPEZOID

TRIANGLE

TRIANGLE, EQUILATERAL

TRIANGLE, RIGHT

TRIANGLE, RIGHT (Isosceles)

TRIANGLE, RIGHT (30° - 60°)



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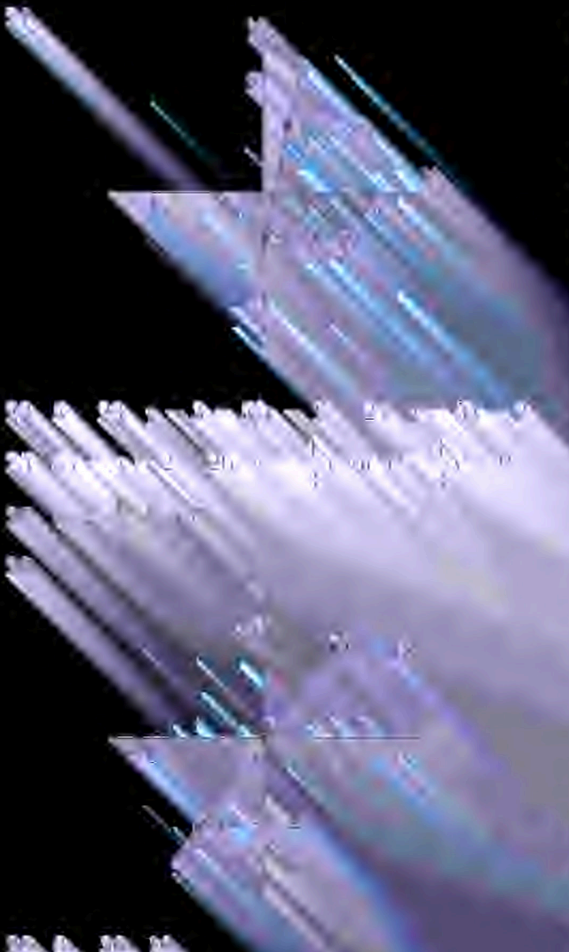

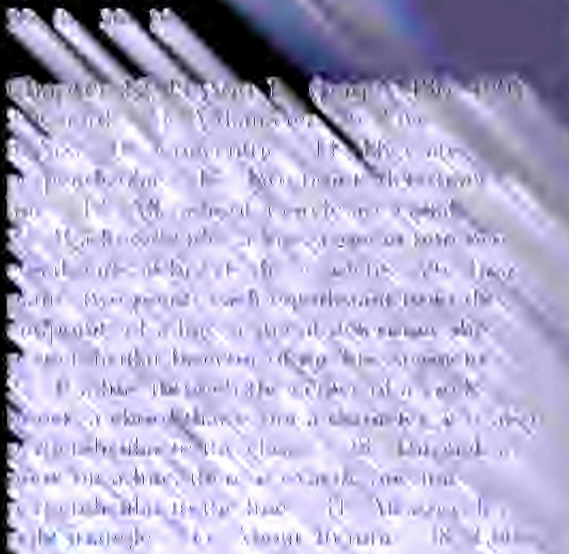

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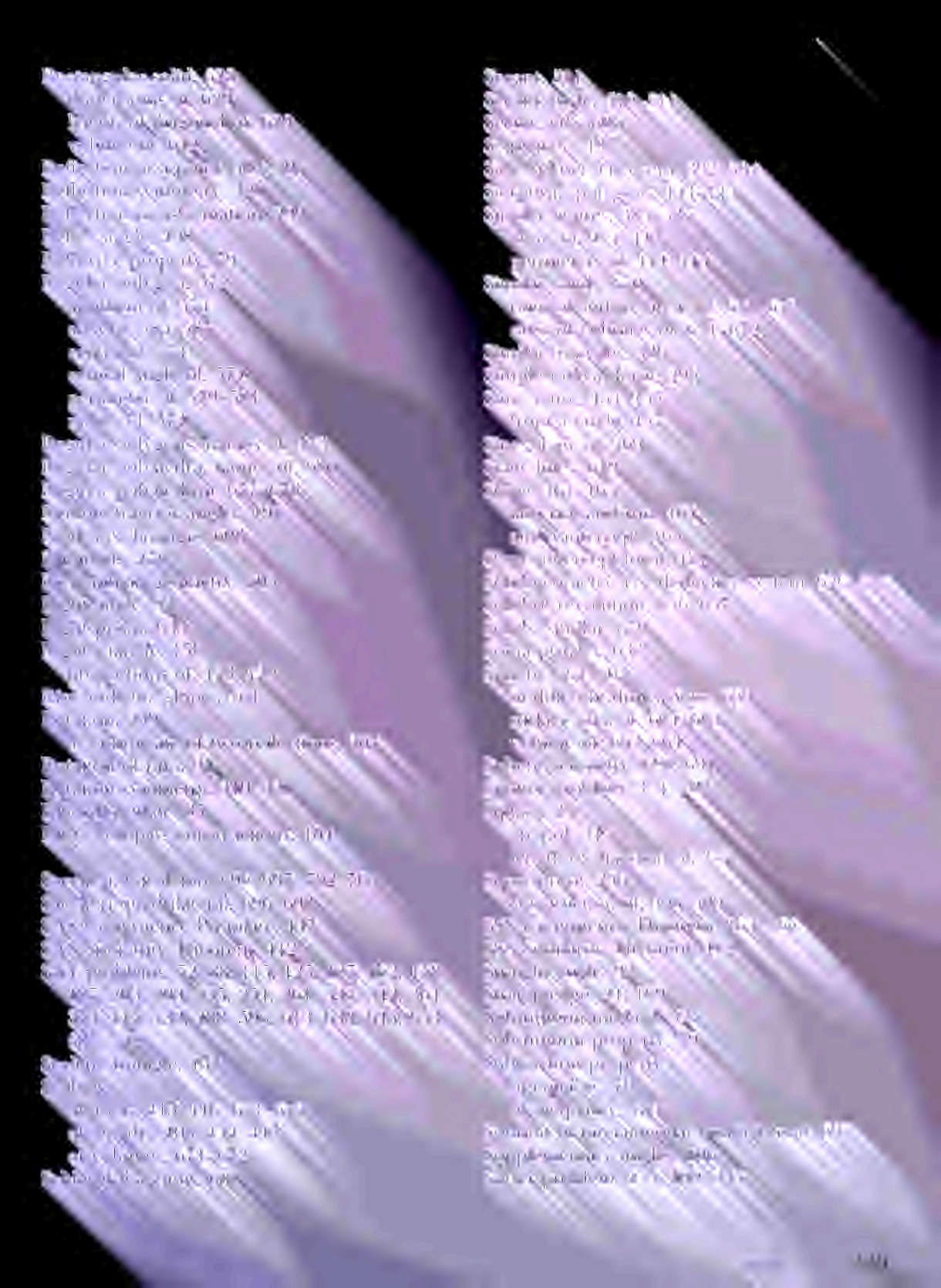

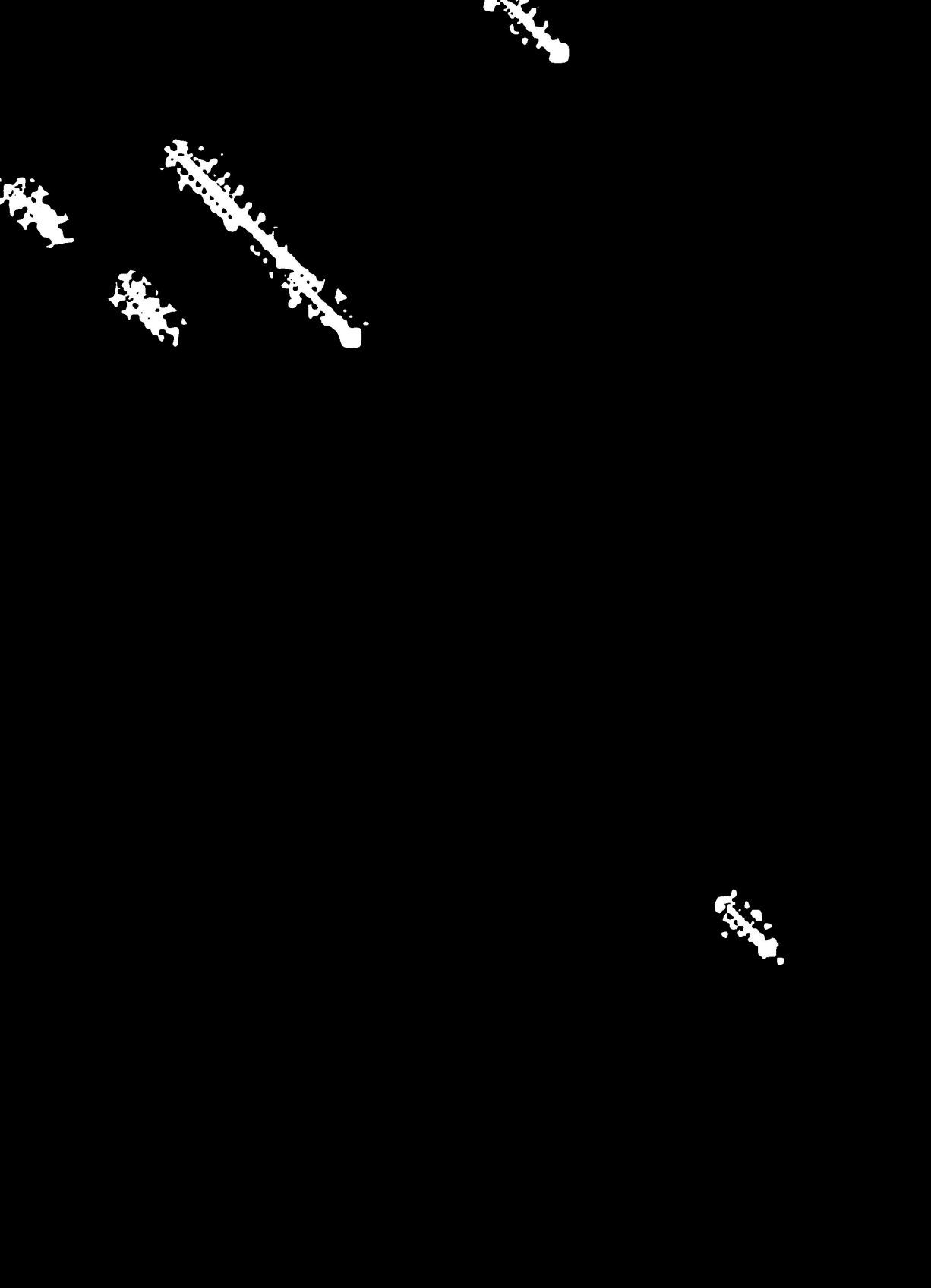





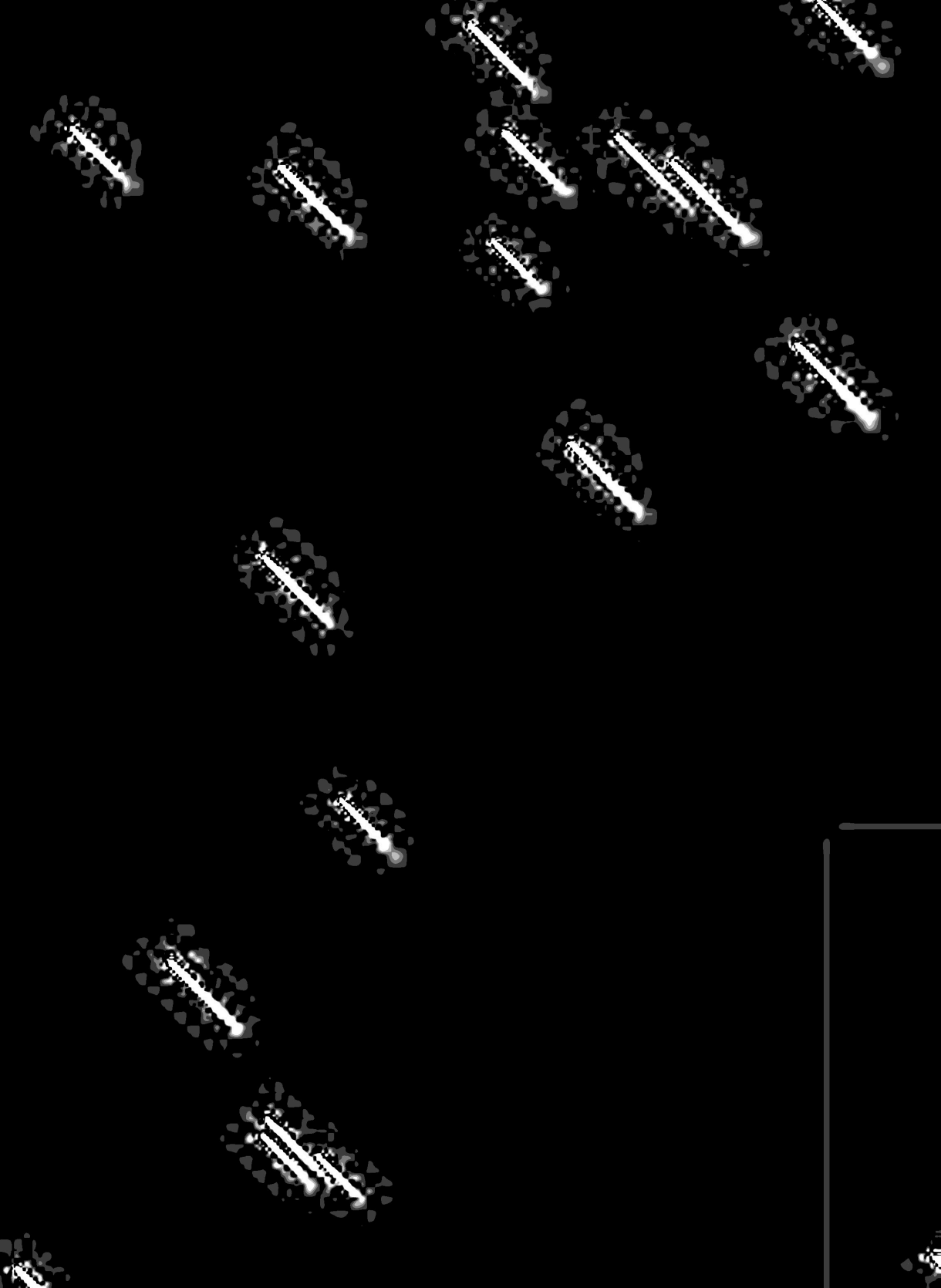

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