Lecture 35
Language Review

• Lecture Outline
• Paragraph Unity
• Paragraph Coherence
• Transitional Words and Phrases
• Common Transitional Words and Phrases
• Paragraph Development

Paragraph Unity:
The latest electronic innovation, still under development is called "adaptive optics." Adaptive optics is an electronic feedback mechanism capable of correcting for the distorting effects of the earth's atmosphere and thus allowing much sharper images of astronomical objects. The earth's atmosphere is constantly shimmering, because of moving pockets of air and changes in temperature, and such shimmering causes passing light rays to bend one way then another. In effect, the shifting atmosphere acts as a rapidly changing lens, smearing out and defocusing images. In adaptive optics, motorized cushions a replaced behind the telescope's secondary mirror and constantly reshape the mirror's surface to counteract the defocusing effect of the atmosphere.

The cushions are given instructions by a computer, which analyzes the image of a "guide star" in the same field of view as whatever the telescope is looking at. With no atmospheric distortion, the image of a star should be a single point of light. By analyzing how the actual image of the guide star differs from a point, the computer can infer the distortion of the atmosphere and tell the cushions how to alter the mirror to bring the guide star, and all the objects near it, back into sharp focus. Corrections must be made rapidly, because the atmosphere is rapidly shifting. In practice, the computer will analyze the image of a guide star and give new instructions to the reshaping cushions every 0.01 to 0.1 seconds.

--Alan Light man, Ancient Light

Topic sentence:

Time became a key word in the language of physics during the seventeenth century. Isaac Newton wove the passage of time directly into his equations, as in force = mass × acceleration. Today, it is difficult for any physicist to examine the universe without thinking of time in much the same way as the illustrious Briton did more than 300 years ago. Most of the laws of physics continue to be written in the style of Newton; they are designed to show how things change from one moment to the next. Each event under study, such as the path of a ball thrown into the air or the thermodynamics of a melting ice cube, is broken down into a series of freeze-frames that, run like a movie, show how nature works.

Newton had placed a clock upon the mantel of the universe. This Newtonian timepiece ticked and ticked, chiming like some cosmic Big Ben, in step with all the celestial inhabitants, no matter what their speed or position. That meant that a clock situated at the edge of the universe or zipping about the cosmos at high velocities would register the same passage of time, identical minutes and identical seconds, as an earthbound clock. More important, the Newtonian clock was never affected by the events going on around it. Time was aloof and absolute, alike for all as galaxies collided; solar systems formed, and moons orbited planets.

Time led an independent existence, separate from nature itself.

Marcia Bartusiak, "When the Universe Began, What Time Was It?" Technology Review

Paragraph Coherence:
Weak
Limited investment in the housing sector makes it practically impossible to allocate sufficient resources for urban dwellers' housing needs. A high rate of urban population growth has increased the country's needs for housing. A small group of city officials has laid out a new
plan to combat the crisis. A solution to the housing-shortage problem is a vital policy issue here. The housing problem has grown in the last twenty years. [Although related by topic (housing shortage), each sentence makes its own separate point with no link to the sentences before or after. The result is a group of related yet separate ideas instead of one coherent paragraph.]

**Improved Version:**
Limited investment in the housing sector makes it practically impossible to allocate sufficient resources for urban dwellers' housing needs. In fact, the problem has grown in the last twenty years. Because a high rate of urban population growth has increased the country's needs for housing, a solution to the housing-shortage problem is a vital policy issue here. A small group of city officials has laid out a new plan to combat the crisis. [Each separate fact now flows into the next, creating a coherent whole.]

Samuel Nunn, "Role of Local Infrastructure Policies and Economic Development Incentives in Metropolitan Inter jurisdictional Cooperation," *Journal of Urban Planning and Development*

**Transitional Words and Phrases:**

**Weak version**
Reducing drag in an aerospace vehicle is an important design consideration with financial and operational consequences. Poorly designed rocket fuselage scan triple fuel and launch costs. Drag increases stress on key joints. This proposed project will develop a model to reduce aerodynamic drag on the RX100.

**Improved version:**
Reducing drag in an aerospace vehicle is an important design consideration. For example, poorly designed rocket fuselages can triple fuel and launch costs. Moreover, drag increases stress on key joints. Therefore, this proposed project will develop a model to reduce aerodynamic drag on the RX100.

**Linking Pronouns:**

**Weak version**
In 1912, the German chemist von Laue hypothesized that in a crystal x-ray, scattering patterns are related to atom spacing. A series of experiments demonstrated the wave nature of x-rays and the periodic arrangement of atoms. Spots on a photographic plate provided the proof for the hypothesis.

**Improved version**
In 1912, the German chemist von Laue hypothesized that in a crystal x-ray, scattering patterns are related to atom spacing. His series of experiments demonstrated the wave nature of x-rays and the periodic arrangement of atoms. Spots on a photographic plate provided the proof for his hypothesis.

**Repetition of Key Words:**

**Weak version**
This broadcast packet switching should be distinguished from the store-and-forward variety. To handle the demands of growth, our system can be extended using repeaters for signal regeneration, filters for traffic localization, or gateways for internet work address extension.

**Improved version**
This broadcast packet switching should be distinguished from the store-and-forward variety. To handle the demands of growth, our system can be extended using packet repeaters for signal regeneration, packet filters for traffic localization, or packet gateways for internet work address extension. [The main point, packets, is now highlighted.]

R. M. Metcalfe and D. R. Boggs, "Ethernet: Distributed Packet Switching for Local Networks" (modified)
Paragraph development:
Exemplification
Use exemplification paragraphs to provide instances that clarify your topic statement. In the following paragraph, the topic sentence is supported in examples that illustrate, support, and clarify the main point.

Narration
Use narration to establish a series of events that tells the reader what happened. Narration follows a chronological pattern of development. It is a convincing mode of paragraph development to the extent that it tells a coherent story. This pattern or time line is usually very easy to understand. In the following narrative, the first narrative paragraph is followed by two descriptive paragraphs. Note the use of transitional words such as thereafter, first, next, and after.

Process:
Example
Ideally, an image should contain a region of high-intensity pixels that form the target, and a low-intensity background. To find the target region, the algorithm first samples the images in overlapping windows and sums the pixel intensities contained in each window. The window with the highest sum is assumed to contain the target, and the average of the remaining windows is assumed to be indicative of the background level. Thus, subtracting the average of the window sums from the highest window sum provides a measure of the target strength over the background noise level. If an image does not contain a target, then the different between the highest sum and the average sum will be very small. The difference will also be small for images containing faint targets and high levels of background noise.

Description:
Analogy

Example

The Immunological Defenders and How They Work
The immune response of billions of cellular defenders is carried out by different kinds of white blood cells, all of which are continuously being produced in the bone marrow. Neutrophils, one type of white blood cell, travel in the blood stream to areas of invasion, attacking and ingesting pathogens. Macrophages, or "big eaters," take up stations in tissues and act as scavengers, devouring pathogen sand worn-out cells. Natural killer cells directly destroy virus-infected cells and cells that have turned cancerous. When lymph nodes are actively involved in fighting an invasion of microorganisms, they fill with lymphocytes.

P. Insel and W. Roth, Core Concepts in Health

Cause and Effect:

Example

Global climate change resulting from the accumulation of greenhouse gases, for example, is likely to have significant health effects, both direct and indirect. An average global temperature rise of 3-4°C, predicted for the year 2100 by the Intergovernmental Panel on Climate Change, will greatly increase the number of days in the United States with temperatures over 38°C(100°F), with a resulting sharp rise in heat-related mortality. Deaths would occur primarily from heat strokes, heart attacks, and cerebral strokes. The very young, poor, and elderly, as well as those with chronic cardiovascular and respiratory diseases, are most at risk. During the two-week heat wave of July 1993 in the eastern United States, 84 people died in Philadelphia alone as a result of the higher temperatures.

E. Chivan, "The Ultimate Preventive Medicine," Technology Review