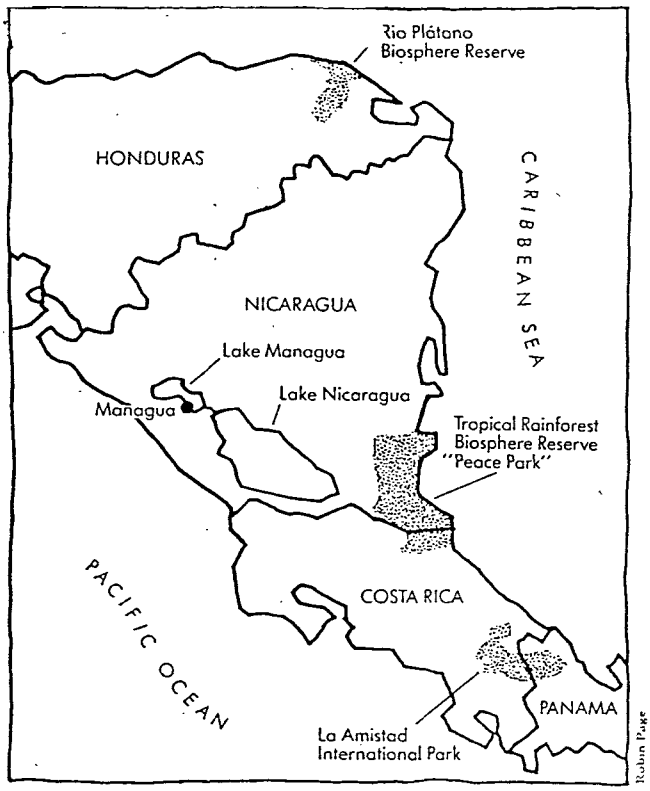
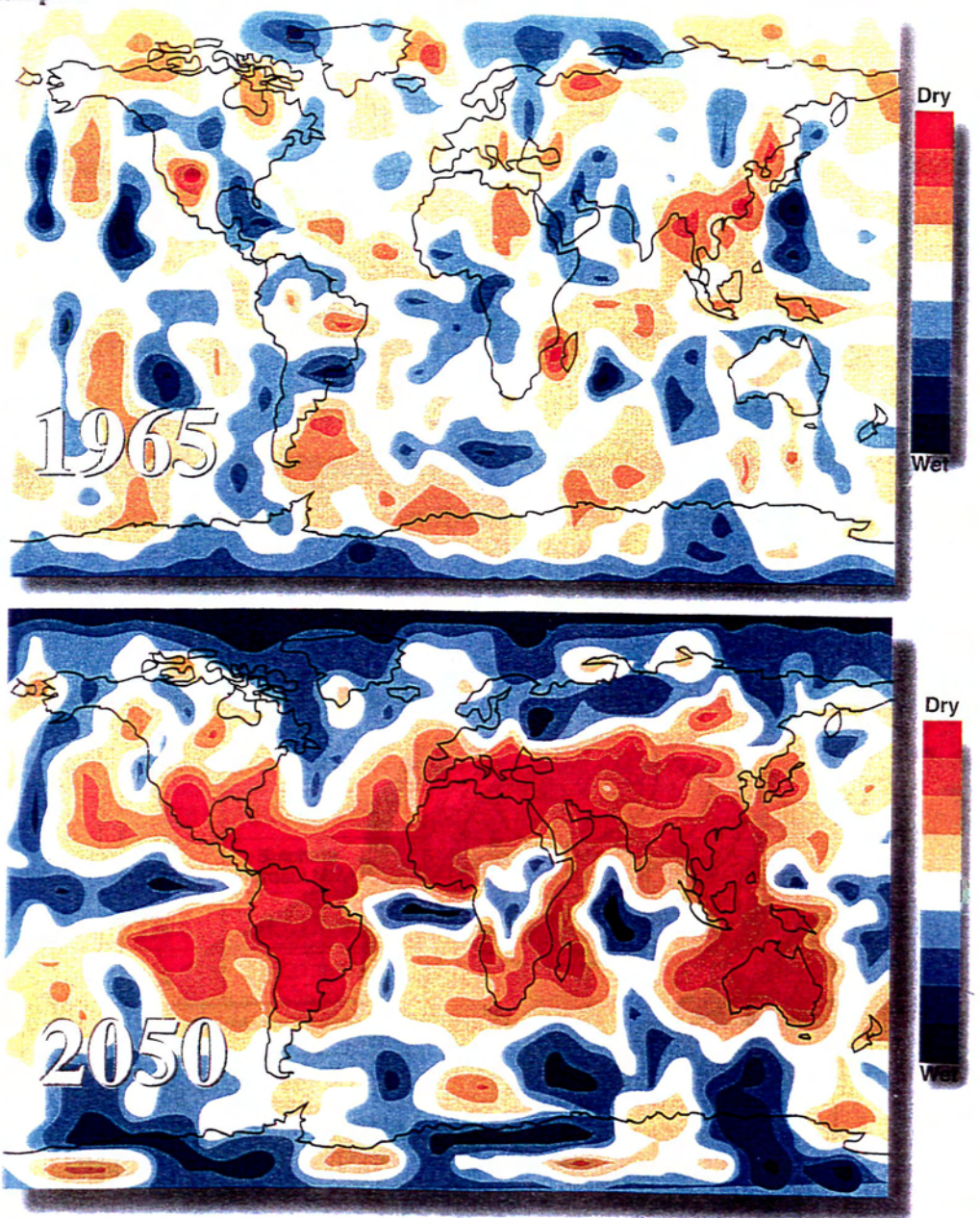


Figure 5. 17 DTP1 (map of Central America) from Make Parks, Not War. *The Amicus Journal,* Fall, 1987.

DTP1 (map of Central America) is a schematic visual that provides the readers with information concerning the location of Nicaragua's national parks. There is no caption accompanying the map. Two-thirds of one page is devoted to one map which appears to have low ideational and interpersonal function. Its textual function is only to provide the physical location of the subject matter of the verbal text which makes this a low value visual.

5.3.2.4 Quadrant B visuals : Climate change

Examples



Climate chaos: model predictions for the increases in drought and flood conditions due to greenhouse gas emissions, for 1965 and 2050. By 2050, with a temperature rise of 4 °C, severe droughts (red) would become frequent in the tropics and middle latitudes

Figure 5. 18 CCD5 (climate model) from Drying out the Tropics, *New Scientist*, May 6, 1995.

This figure comprises a pictorial presentation of the results of computer modelling that compares global climate conditions in 1965 with predictions for 2050, and assists the readers in grasping the dramatic nature of predicted changes. Ideationally, colouring in the models aids understanding just how severely certain parts of tropical

countries will be affected. The caption assists the reader's absorption of information, adding that the projected dire climate conditions, possibly involving a temperature rise of 4°C, is caused by greenhouse gas emissions. In textual terms, the figure summarises the ideas presented in EVALUATION and SPECIFIC CLAIM for the readers. Even though the visual is presented in a stylised form, it conveys interpersonal meaning. Readers, especially those who live in tropical areas, would find the information alarming. Firstly, the readers would be struck by the emotionally disturbing title of the caption (*Climate chaos*). Secondly, the figure is placed next to portentous wording, which repeatedly mentions *frequent severe droughts* and *frequent droughts, severe droughts* appearing twice in the caption. Within half a page, the readers are told many times that the tropics would experience dire consequences from climate change processes.

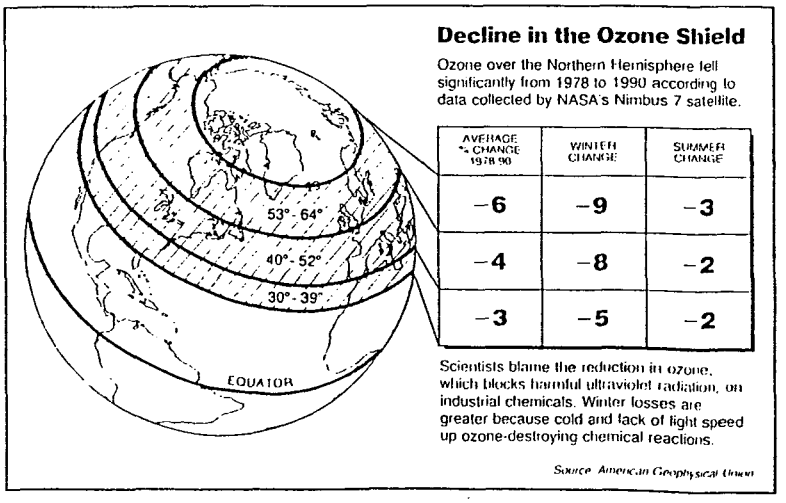


Figure 5. 19 CCOT6 (ozone decline) from As the Ozone Thins, the Plot Thickens, *The Amicus Journal*, Summer 1991.

Figure 5.19 is a combination of two forms of non-verbal representation, namely, pictorial and tabular, which are interdependent. The picture of the globe shows the parts of the world located at different latitudes above the equator and the table compares the amount of ozone losses during winter and summer at the different latitudes indicated on the globe. The readers receive the total gestalt by looking at the

visuals alone. The caption helps to increase the reader's understanding of ozone decline. Overall they provide the readers with knowledge about the winter and summer ozone declines in the Northern hemisphere. Together, they perform an interesting textual function in that they do not summarise the wording nor reiterate a certain point of the argument. The function of this figure can be viewed in two ways: firstly, as an attempt to summarise the section of the article which describes ozone losses, or secondly as additional information which is useful to the readers. It, however, can be regarded as having a 'double seeing' effect in that the figure acts as a summary of what was established prior to the article. It works as a text parallel to the article. When readers read the article and look at the visual, they understand the article more clearly because they have more than one source of information from which they can learn.

COVER STORY

The Heat Is On

Chemical wastes spewed into the air threaten the earth's climate

At this time of year, the Cabo de Hornos Hotel in Punta Arenas (pop. 100,000) is ordinarily filled with tourists who spend their days browsing in the local tax-free shops or mounting expeditions into the rugged, mountainous countryside just out of town. But the 120 mostly American scientists and technicians who converged on Chile's southernmost city for most of August and September ignored advertisements for hunting, hiking and ski tours. Instead, each day they scanned the bulletin board in the hotel lobby for the latest information on a different sort of venture.

Thirteen times during their eight-week stay, a specially outfitted DC-8 took off from the Presidente Ibañez Airport, twelve miles northeast of Punta Arenas. Often the 40-odd scientists and support crew listed for a given flight had to leave the hotel soon after midnight to prepare the plane and its research instruments. Once airborne, the DC-8 would bank south toward Antarctica, 1,000 miles away, fighting vicious winds before settling into a twelve-hour round-trip flight at altitudes of up to 40,000 ft. Along the way, the instruments continuously collected data on atmospheric gases, airborne particles and solar radiation high above the frozen continent. Meantime, parallel flights took off from Ibañez to gather additional atmospheric data at nearly twice the altitude. Manned by a lone pilot, a Lockheed ER-2, the research version of the high-altitude U-2 spy plane, made twelve sorties into the lower stratosphere, cruising at nearly 70,000 ft., or more than 13 miles, for six hours at a time.

Both aircraft were part of an unprecedented, $10 million scientific mission carried out by the U.S. under the combined sponsorship of NASA, the National Oceanic and Atmospheric Administration, the National Science Foundation and the Chemical Manufacturers Association. The purpose: to find out why the layer of ozone gas in the upper atmosphere, which protects the earth's surface from lethal solar ultraviolet radiation, was badly depleted over Antarctica. The scale of the mission reflected an intensifying push to understand the detailed dynamics of potentially disastrous changes in the climate.

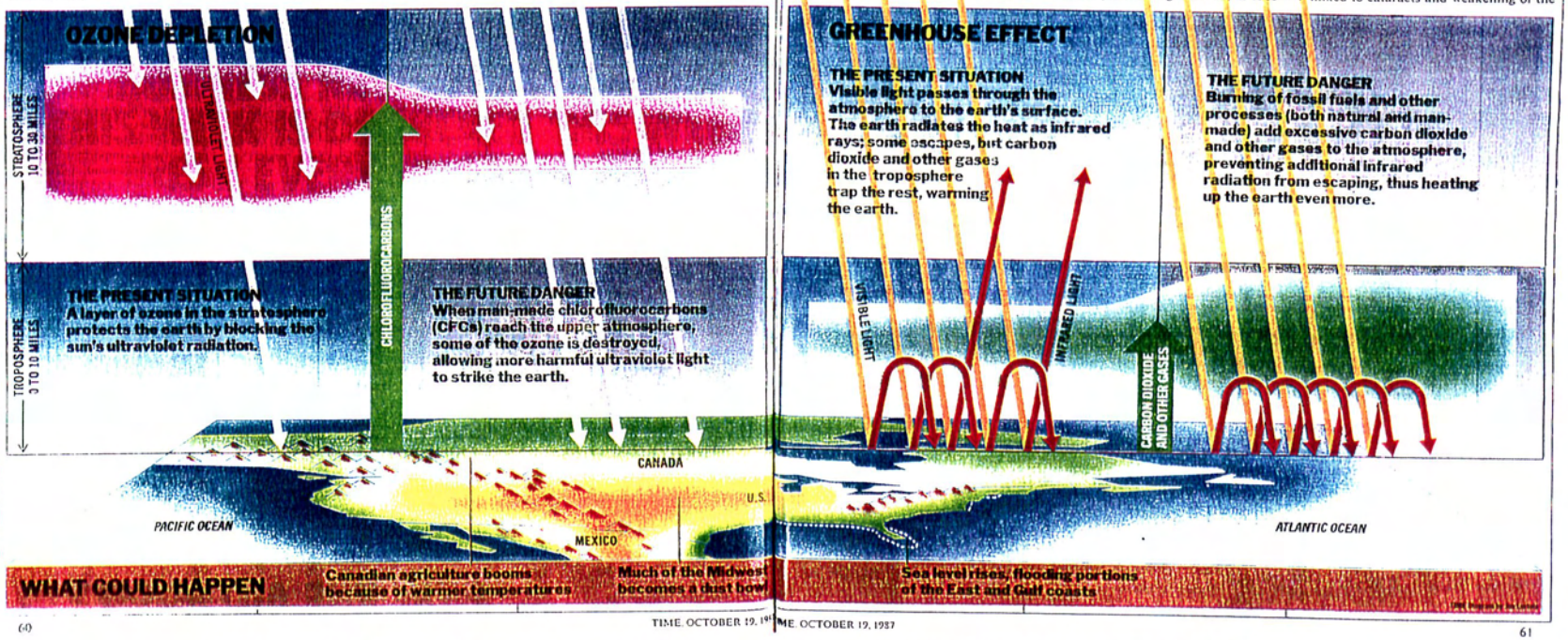
The danger of ozone depletion is only part of the problem; scientists are also concerned about the "greenhouse effect," a long-term warming of the planet caused by chemical changes in the atmosphere.

The threat to the ozone was first discovered in 1983, when scientists with the British Antarctic Survey made the startling observation that concentrations of ozone in the stratosphere were dropping at a dramatic rate over Antarctica each austral spring, only to gradually become replenished by the end of November. At first they speculated that the phenomenon might be the result of increased sunspot activity or the unusual weather systems of the Antarctic. It is now widely accepted that winds are partly responsible, but scientists are increasingly convinced that there is a more disturbing factor at work. The culprit: a group of man-made chemicals called chlorofluorocarbons (CFCs), which are used, among other things, as coolants in refrigerators and air conditioners, for making plastic foams, and as cleaning solvents for microelectronic circuitry. Mounting evidence has demonstrated that under certain conditions these compounds, rising from earth high into the stratosphere, set off chemical reactions that rapidly destroy ozone.

The precise chemical process is still uncertain, but the central role of CFCs is undeniable. Last month Barney Farmer, an atmospheric physicist at the Jet Propulsion Laboratory in Pasadena, Calif., announced that his ground-based observations as a member of the 1986 Antarctic National Ozone Expedition pointed directly to a CFC-ozone link. "The evidence isn't final," he said, "but it's strong enough." Earlier this month, results from NASA's Punta Arenas project confirmed the bad news. Not only was the ozone hole more severely depleted than ever before—fully 50% of the gas had disappeared during the polar thaw, compared with the previous high of 40% in 1985—but the CFC connection was more evident. Notes Sherwood Rowland, a chemist at the University of California at Irvine: "The measurements are cleaner this time, more detailed. They're seeing the chemical chain more clearly."

Atmospheric scientists have long known that there are broad historical cycles of global warming and cooling; most experts believe that the earth's surface gradually began warming after the last ice age peaked 18,000 years ago. But only recently has it dawned on scientists that these climatic cycles can be affected by man. Says Stephen Schneider, of the National Center for Atmospheric Research in Boulder: "Humans are altering the earth's surface and changing the atmosphere at such a rate that we have become a competitor with natural forces that maintain our climate. What is new is the potential irreversibility of the changes that are now taking place."

Indeed, if the ozone layer diminishes over populated areas—and there is some evidence that it has begun to do so, although nowhere as dramatically as in the Antarctic—the consequences could be dire. Ultraviolet radiation, a form of light invisible to the human eye, causes sunburn and skin cancer; in addition, it has been linked to cataracts and weakening of the



60 TIME, OCTOBER 19, 1987 TIME, OCTOBER 19, 1987 61

Figure 5. 20 CCH1 (ozone depletion) from The Heat Is On, *Time*, October 19, 1987.

CCH1 (ozone depletion) contains information in a stylised form about ozone depletion and the greenhouse effect (the sun's rays, clouds, mountains, seas etc.). The stylisation assists the diagram in representing the atmospheric processes involved, and at the same maintains scientific concepts and presents them in an intelligible fashion. The diagram contains high values of the three metafunctions. Experientially, it explains to the readers the process of ozone depletion and greenhouse effect while textually, it summarises all of the main points of the article. Interpersonally, its impact is one which causes anxiety in the reader's mind by the lexical resources employed in the caption. For example, the label in the diagram (*The future danger*) conveys a negative view of the future. The label could be presented in a more neutral manner, for example, *The present situation* could move to *The future situation* instead of *The future danger* which pre-judges the topic. Such a title is obviously capable of engaging the readers emotionally. Another caption accompanying the diagram (*What could happen*) also disturbs the reader's state of mind. Even though the low-valued modality: 'probability' *could* is used in the subheadings, the propositions (*Much of the Mid-West becomes a dust bowl* and *Sea level rises, flooding portions of the East Gulf coasts*) are made in present tense, giving the feeling of "here and now" and thus make the predicted propositions much more definite. This is reinforced by the specificity of the predictions. Considered together with the title of the article (*The Heat Is On*), and occupying more than half a page on each of two pages, the diagram is effective in amplifying the reader's anxiety about the future.

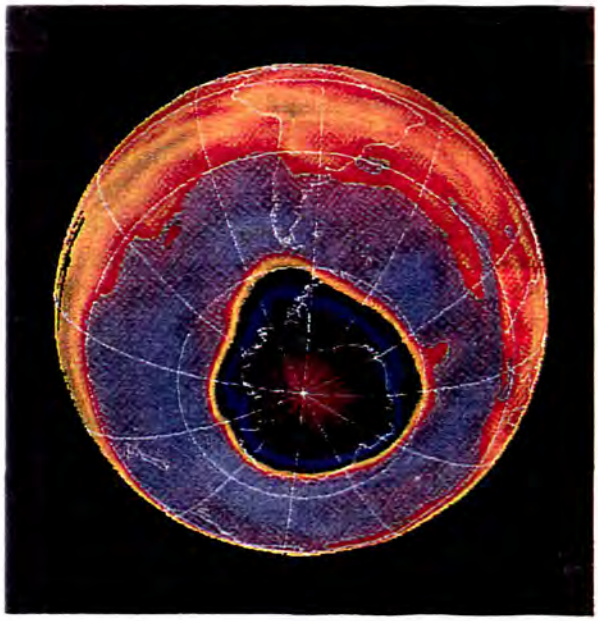
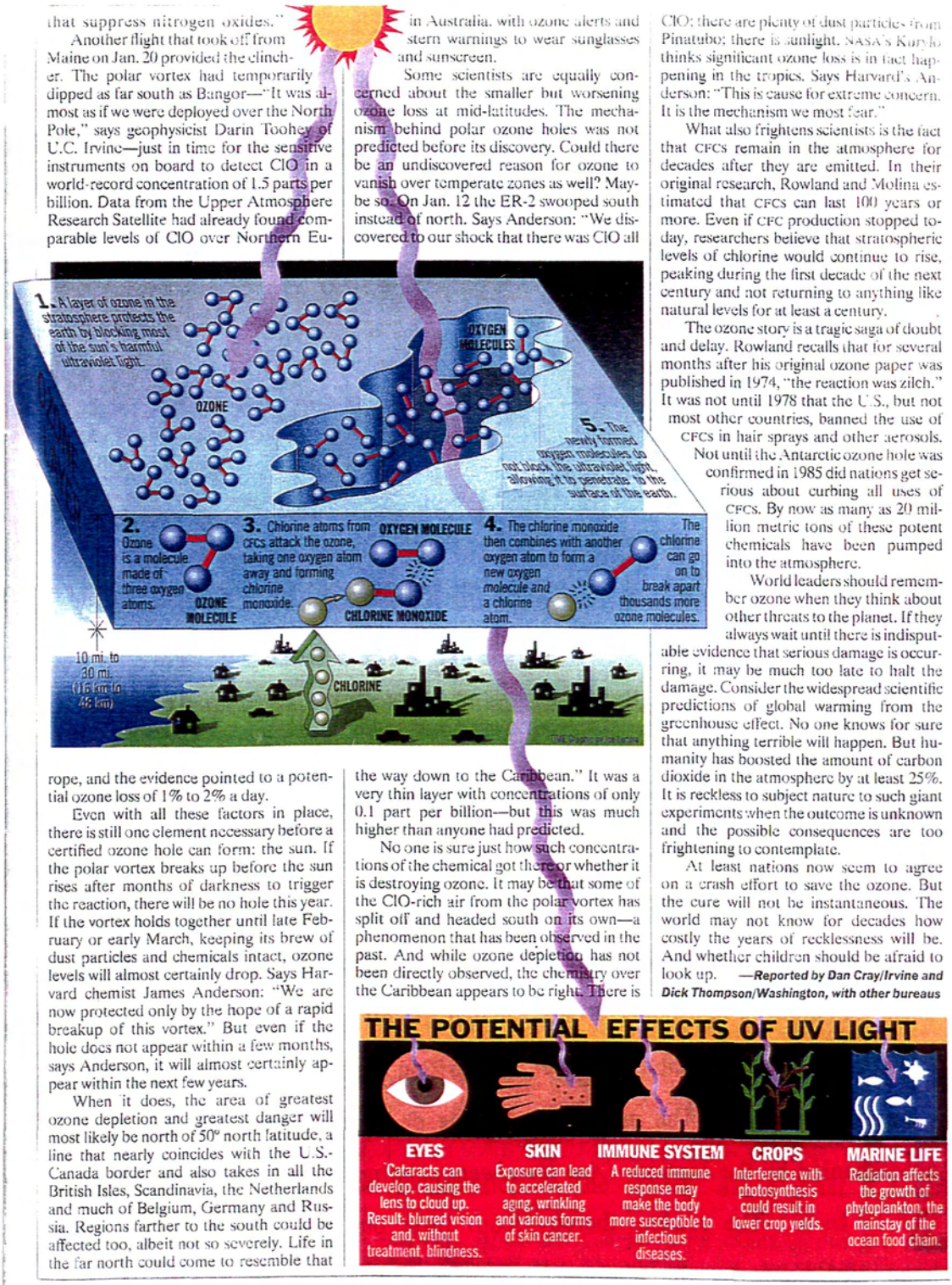


Figure 5. 21 CCS1 (ozone hole) from Son of Ozone Hole, *Discover*, October 1993.

CCS1 (ozone hole), the only visual in the article, is a computerised image of the globe showing the spring ozone hole over the South Pole. The caption (*Purple pulsing presence of the polar spring: The ozone hole*) echoes the same ideational meaning as shown in the picture. It merely summarises the main point of the argument and does not have high interpersonal impact on the reader.

Figure 5.22 below is an example of visuals that are informative but still entice interpersonal reaction. As with CCH1 (ozone depletion) above, the diagram pictorialises the process of ozone depletion, and the potential harmful effects of ultraviolet light (the ultraviolet rays depicted by violet arrows, oxygen and ozone molecules, houses, factories etc.), which makes it easier for the readers to retain the information in their memory. Experientially, the visual summarises existing knowledge about how the ozone layer is depleted and what effects it could cause. Textually, the diagram sums up the main idea in the written text. Interpersonally, the information affects the readers emotionally because they recognise the potential dangers caused by ozone depletion such as cataracts, skin cancers, and low immune system. These dangers are presented by images of searing violet arrows piercing

sensitive body parts (an eye and an arm) while the harmful effects are written onto a background of red, the colour of danger



that suppress nitrogen oxides."

Another flight that took off from Maine on Jan. 20 provided the clincher. The polar vortex had temporarily dipped as far south as Bangor—"It was almost as if we were deployed over the North Pole," says geophysicist Darin Toohey of U.C. Irvine—just in time for the sensitive instruments on board to detect ClO in a world-record concentration of 1.5 parts per billion. Data from the Upper Atmosphere Research Satellite had already found comparable levels of ClO over Northern Europe, and the evidence pointed to a potential ozone loss of 1% to 2% a day.

Even with all these factors in place, there is still one element necessary before a certified ozone hole can form: the sun. If the polar vortex breaks up before the sun rises after months of darkness to trigger the reaction, there will be no hole this year. If the vortex holds together until late February or early March, keeping its brew of dust particles and chemicals intact, ozone levels will almost certainly drop. Says Harvard chemist James Anderson: "We are now protected only by the hope of a rapid breakup of this vortex." But even if the hole does not appear within a few months, says Anderson, it will almost certainly appear within the next few years.

When it does, the area of greatest ozone depletion and greatest danger will most likely be north of 50° north latitude, a line that nearly coincides with the U.S.-Canada border and also takes in all the British Isles, Scandinavia, the Netherlands and much of Belgium, Germany and Russia. Regions farther to the south could be affected too, albeit not so severely. Life in the far north could come to resemble that in Australia, with ozone alerts and stern warnings to wear sunglasses and sunscreen.

Some scientists are equally concerned about the smaller but worsening ozone loss at mid-latitudes. The mechanism behind polar ozone holes was not predicted before its discovery. Could there be an undiscovered reason for ozone to vanish over temperate zones as well? Maybe so. On Jan. 12 the ER-2 swooped south instead of north. Says Anderson: "We discovered to our shock that there was ClO all the way down to the Caribbean." It was a very thin layer with concentrations of only 0.1 part per billion—but this was much higher than anyone had predicted.

No one is sure just how such concentrations of the chemical got there or whether it is destroying ozone. It may be that some of the ClO-rich air from the polar vortex has split off and headed south on its own—a phenomenon that has been observed in the past. And while ozone depletion has not been directly observed, the chemistry over the Caribbean appears to be right. There is ClO; there are plenty of dust particles from Pinatubo; there is sunlight. NASA's Kurylo thinks significant ozone loss is in fact happening in the tropics. Says Harvard's Anderson: "This is cause for extreme concern. It is the mechanism we most fear."

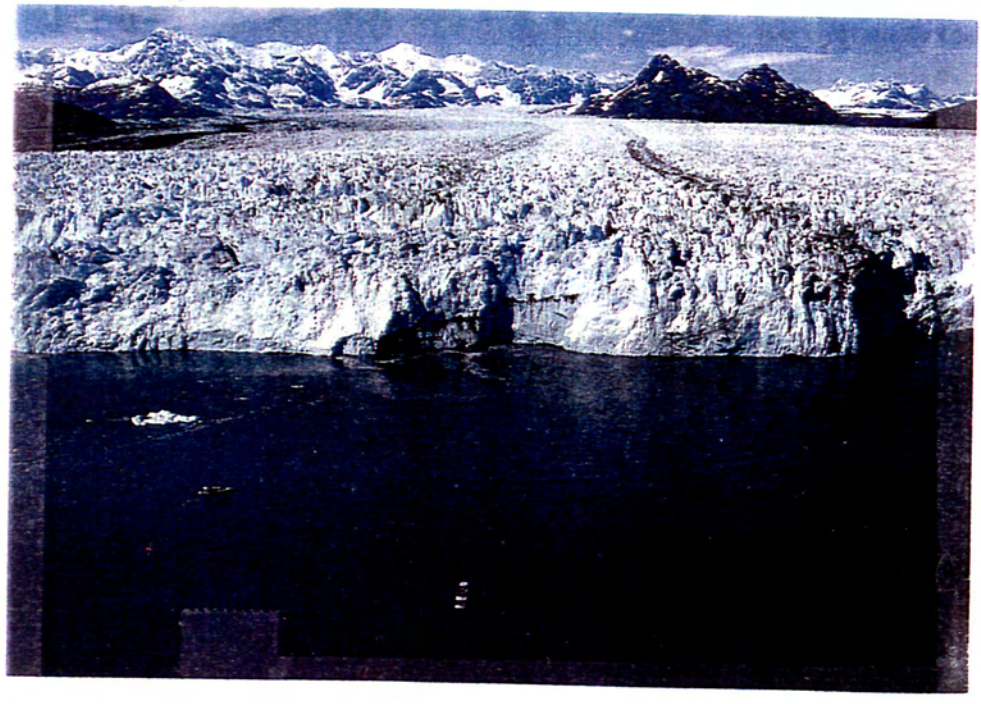
What also frightens scientists is the fact that CFCs remain in the atmosphere for decades after they are emitted. In their original research, Rowland and Molina estimated that CFCs can last 100 years or more. Even if CFC production stopped today, researchers believe that stratospheric levels of chlorine would continue to rise, peaking during the first decade of the next century and not returning to anything like natural levels for at least a century.

The ozone story is a tragic saga of doubt and delay. Rowland recalls that for several months after his original ozone paper was published in 1974, "the reaction was zilch." It was not until 1978 that the U.S., but not most other countries, banned the use of CFCs in hair sprays and other aerosols. Not until the Antarctic ozone hole was confirmed in 1985 did nations get serious about curbing all uses of CFCs. By now as many as 20 million metric tons of these potent chemicals have been pumped into the atmosphere.

World leaders should remember ozone when they think about other threats to the planet. If they always wait until there is indisputable evidence that serious damage is occurring, it may be much too late to halt the damage. Consider the widespread scientific predictions of global warming from the greenhouse effect. No one knows for sure that anything terrible will happen. But humanity has boosted the amount of carbon dioxide in the atmosphere by at least 25%. It is reckless to subject nature to such giant experiments when the outcome is unknown and the possible consequences are too frightening to contemplate.

At least nations now seem to agree on a crash effort to save the ozone. But the cure will not be instantaneous. The world may not know for decades how costly the years of recklessness will be. And whether children should be afraid to look up. ***—Reported by Dan Cray/Irvine and Dick Thompson/Washington, with other bureaus***

Figure 5. 22 CCOV4 (ozone danger) from The Ozone Vanishes, *Time*, February 17, 1992.



ARE ICE SHEETS coming or going? Coastal cities would like to know.

Figure 5. 23 CCC1 (ice sheet) from Cold Comfort, *Discover*, August 1992.

The main argument of the text in which Figure 5.23 appears is to discuss that global warming would result in a fall in sea levels not a rise. This central, page one photograph captures the image of ice sheets but it cannot depict the process of the ice sheet retreating or advancing. It is clear that the effect of a photograph in capturing this concept is very limited, however, its position ensures that it will attract attention before the text does. The motive behind the photograph becomes clear when it is accompanied by the caption (*Are ice sheets coming or going? Coastal cities would like to know.*) The readers thereby learn little but the interpersonal meaning is hammered home by the notion of a glacier advancing on a city. Textually, it sensationalises the main point of the text, that is, even though some experiments suggest that ice sheets would grow in summer and sea level would fall, there are still uncertainties about the outcome; sea levels may fall, or rise. Thus, the photograph

itself does not allow the readers to become emotionally involved in it, but together with the caption it renders a strong degree of interpersonal involvement as it plants fear or at least apprehension, in the reader's mind, especially those who live in coastal areas, by using a rhetorical question.

Ice archive: Antarctica is yielding clues about our future climate

Figure 5. 24 CCI3 (icecap2) from Icy Prospects for a Warmer World, *New Scientist*, August 8, 1992.

By comparison, Figure 5.24, a two-third page photograph of a polar landscape gives little information about the text ideationally, textually or interpersonally. The photograph itself provides no information to the readers as to what it means. Furthermore, the caption (*Ice archive: Antarctica is yielding clues about the future climate.*) provides no information concerning what kind of clues about future climate the ice cap may yield. The only clue to why the photograph is there lies in the verbal text which reads: *Some coastal and interior sites in Antarctica have accumulated ice*

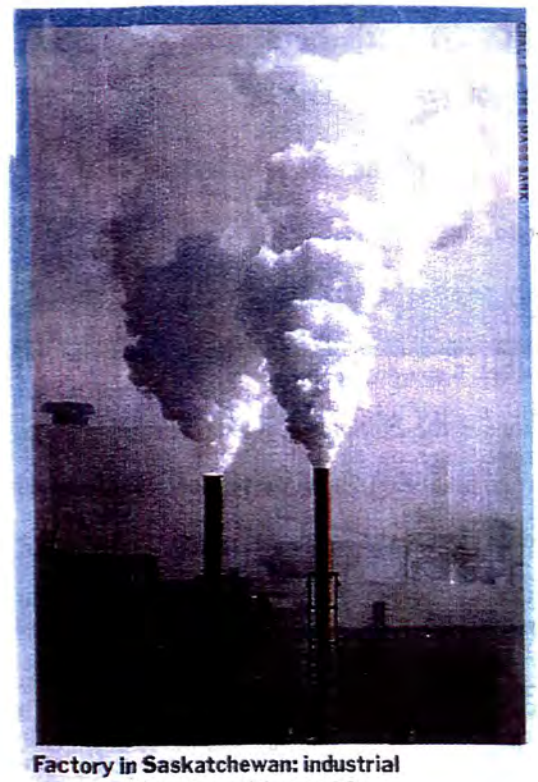
over the past 80 years, giving a growth rate equivalent to a fall in sea level of 0.75 millimetres per year. However, the implications of the caption are far from clear. In this case it appears that the readers must deduce the meaning of the photograph from the written text. In reality such a visual represents an indiscriminate use of barely related, and uninformative images, which appear to be designed partly to do nothing more than fill space or add an artistic dimension to the page.

Figures 5.25 and 5.26 below are taken from different texts (Figure 5.25 is from 'Methane' and Figure 5.26 is from 'Heat') but they share some common characteristics. The photographs depicting rubbish piling up in a tip, and a smokestack emitting smoke, are typical images that have been used in the media to represent the notion of global warming. Both images have become clichéd. Both are naturalised, that is, photographs, but neither convey information which extends the argument in the texts and nor do they summarise the main point. The captions (CCM5: *Rubbish tips ferment to produce a tappable source of methane,* and CCH4: *Factory in Saskachewan: Industrial emissions increase airborne* CO_2) refer to very minor points in the text. The impact of utilising the two photographs is high in terms of interpersonal aspects. CCM5 (rubbish tip) reflects only one source of the methane mentioned in SPECIFIC CLAIM, and this is by a quotation from an expert which reads: "*very large increases in methane production from waste dumps are expected in the coming decades from the developing world*". Because the photograph appears after reading this part of the text, the emotional involvement of readers is amplified. It is as if the readers are constantly reminded that developing countries are the major methane production sites even though it does not state where the photograph of the rubbish tip was taken. Such use of naturalised iconic visuals demonstrates particularly well the Western cultural and social assumptions which inform even popular science discourse. The social impact of the genre is therefore pregnant with meanings which reinforce cultural stereotypes through the presumed irrefutable logic of science. In a similar vein, CCH4 (factory) is a good example of an icon used in the media which produces an emotional effect. In the 'Heat' text, the writer only mentions one factor that

contributes to global warming. In fact, he does not say that smoke factories emit CO_2 at all, but this is apparently not deemed relevant and the assumption appears to be a standard that photograph of smoke coming up from a factory's chimney can depict the issue of global warming.

Rubbish tips ferment to produce a tappable source of methane

Figure 5. 25 CCM5 (rubbish tip) from Methane: The Hidden Greenhouse Gas, *New Scientist*, May 6, 1989.



Factory in Saskatchewan: industrial emissions increase airborne CO_2

Figure 5. 26 CCH4 (factory) from The Heat Is On, *Time*, October 19, 1987.