Welcome
Clearwater 2016

William B. Rose
University of Illinois at Urbana-Champaign

Topics

- Inspiration for this plenary. Hat tip to Andre Desjarlais.
- Building science and the public
- Building science and architecture
- Corners
- Is building research possible?
- Building science and health
- Building science and what's to come
- Closing uplifting remarks

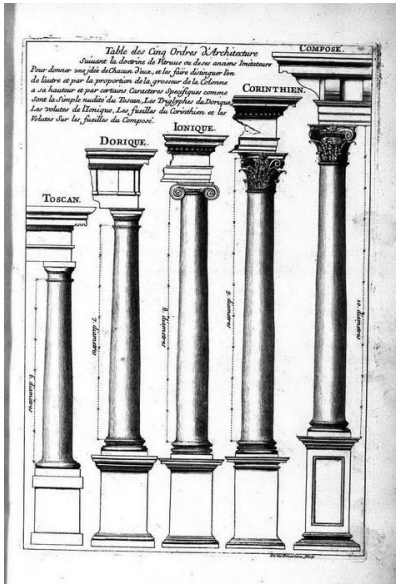
Building science and the public

- What the public wants
  - Rainwater management
  - Dry basements
  - No worries
- Zombie ideas
  - Gotta breathe, gonna trap that moisture in there. Where do you reach dewpoint? Where does the vapor barrier go?
- What to do?
  - Anecdotes, then analysis
  - Good information about real things
  - Science fair projects
  - Entitlement

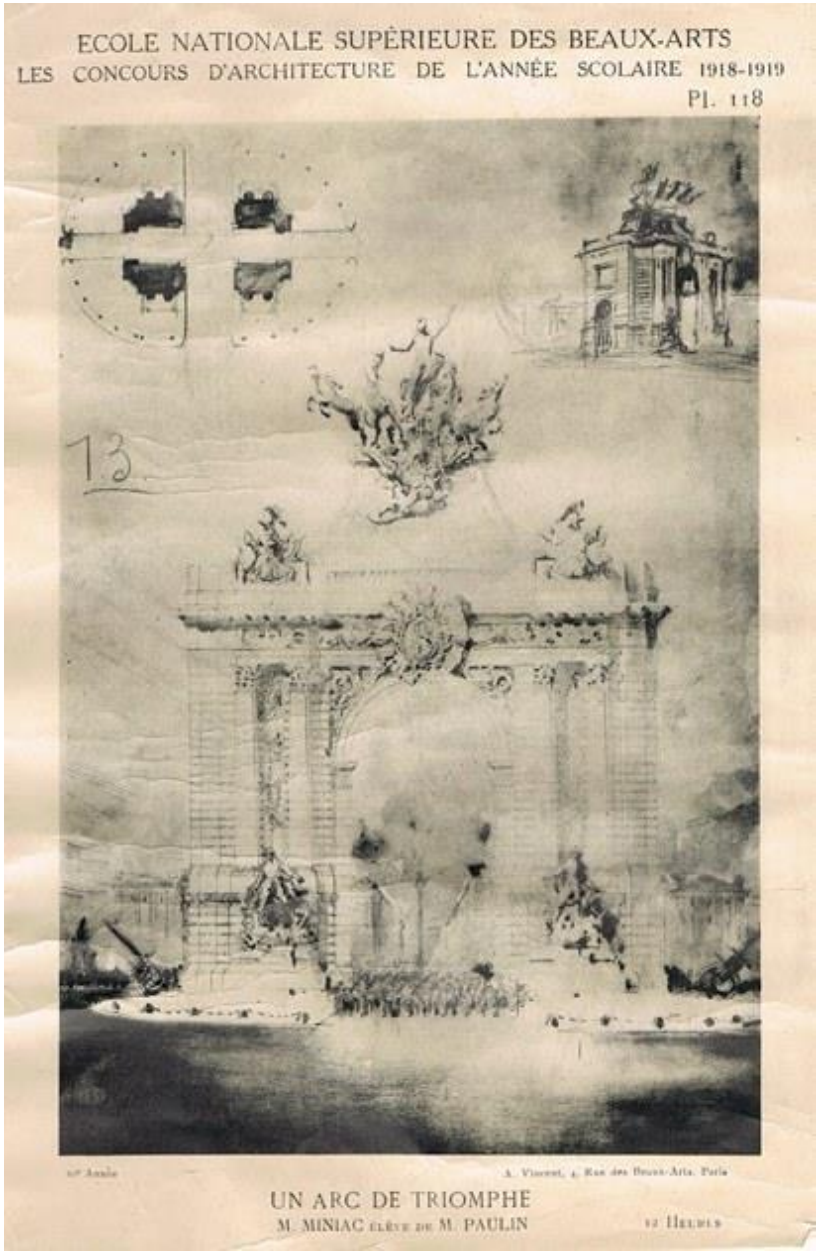
Building science and architecture

- Don Quixote
- Architecture education
  - The jury system
  - The word “design”
  - Technical and design educations
- Technical arch ed for the US
  - Existing buildings
- Background
  - Colbert and the Academy
  - Viollet-le-Duc
  - ASHRAE 1895
  - Max Abramovitz

Jean-Baptiste Colbert finance minister under Louis XIV
Académie d'architecture 1671

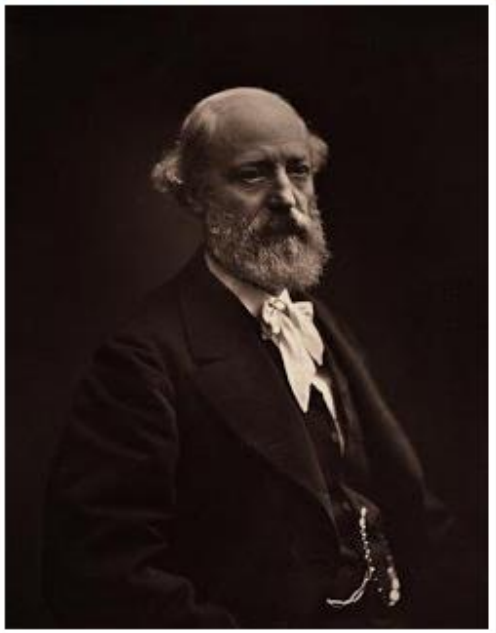


Eugène Emmanuel Viollet-le-Duc
1864



MERCREDI 19 JANVIER 2011

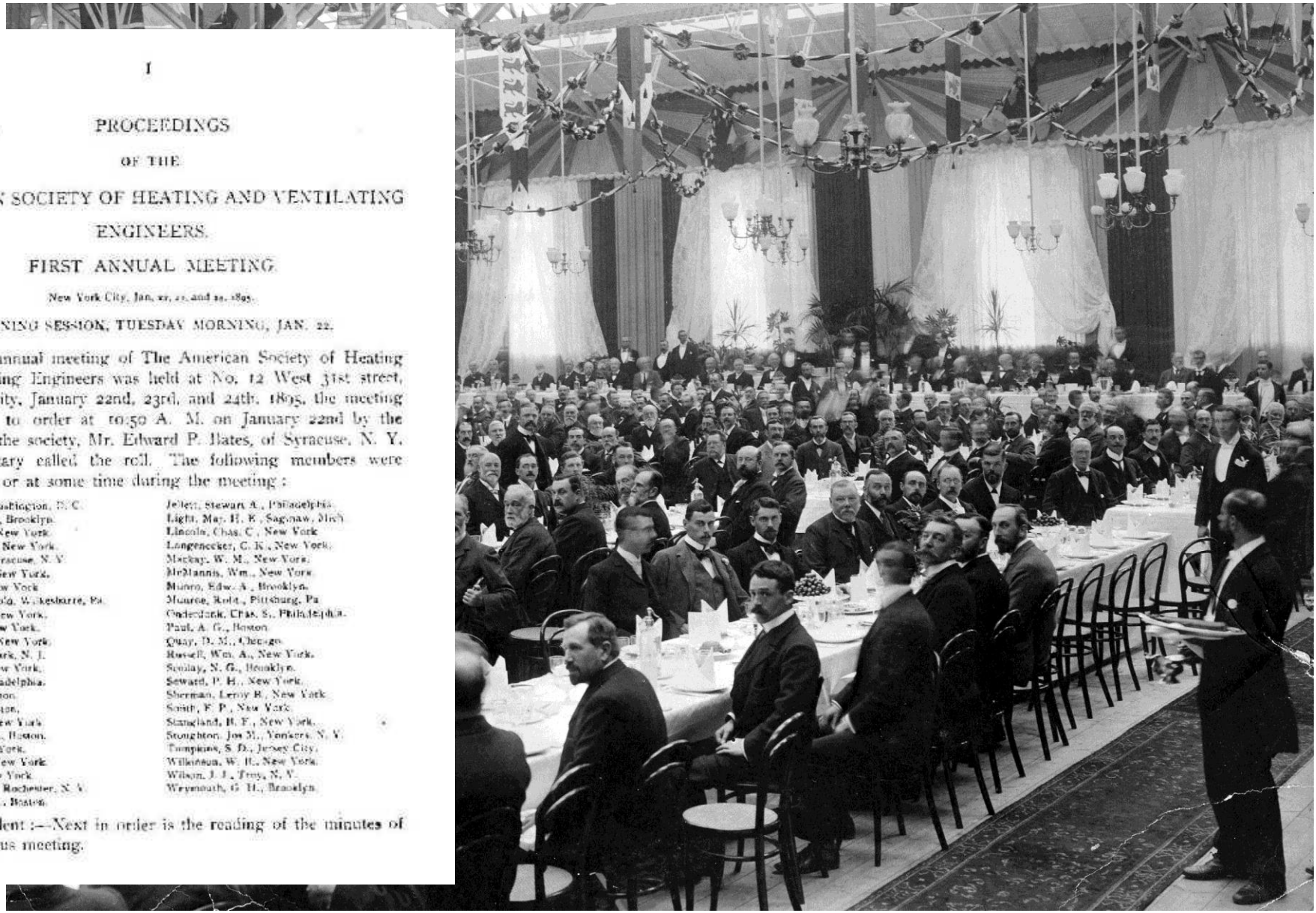
"Les élèves de l'École des Beaux-Arts ne voulaient point de Viollet-le-Duc" (Maxime Du Camp, 1882)



Eugène **Viollet le Duc** (1814-1879), éphémère professeur d'esthétique et d'architecture à l'Ecole nationale de Beaux-Arts. Photographie de Nadar. Strasbourg, musée d'art moderne et contemporain.

« La journée du 29 janvier 1864 est restée légendaire dans les annales de l'École des Beaux-Arts ; selon le langage de l'endroit, ce fut un *"chahut babylonien"*. Le comte de Nieuwerkerke, en qualité de surintendant des Beaux-Arts, était venu installer le nouveau professeur il était accompagné de Mérimée, qui jouait le personnage du *fidus Achates*, et de Théophile Gautier, chargé de rendre compte dans *Le Moniteur officiel* du succès de la première leçon. On redoutait des murmures, peut-être même quelque protestation mais on ne s'attendait pas au plus formidable des charivaris qui jamais eussent accueilli un maître de l'enseignement. A peine Viollet-le-Duc fût-il assis dans sa chaire et eut-il ouvert la bouche pour dire : *"Messieurs"* – ce fut le seul mot qu'il put prononcer – que le tumulte commença.

ASHRAE, first meeting 1895 (alt photo)



I

PROCEEDINGS

OF THE

AMERICAN SOCIETY OF HEATING AND VENTILATING

ENGINEERS.

FIRST ANNUAL MEETING

New York City, Jan. 22, 23, and 24, 1895.

OPENING SESSION, TUESDAY MORNING, JAN. 22.

The first annual meeting of The American Society of Heating and Ventilating Engineers was held at No. 12 West 31st street, New York city, January 22nd, 23rd, and 24th, 1895, the meeting being called to order at 10:50 A. M. on January 22nd by the president of the society, Mr. Edward P. Bates, of Syracuse, N. Y.

The secretary called the roll. The following members were present then or at some time during the meeting:

Adams, Henry, Washington, D. C.
Andrus, Newell P., Brooklyn.
Barron, Hugh J., New York.
Barwick, Thomas, New York.
Bates, Edw. P., Syracuse, N. Y.
Blackmore, J. J., New York.
Burns, Samuel, New York.
Carpenter, B. Harold, Wilkesbarre, Pa.
Cary, Albert A., New York.
Cobb, Gen. B., New York.
Cryer, Albert A., New York.
Cryer, T. B., Newark, N. J.
Dewey, W. H., New York.
Edgar, A. C., Philadelphia.
Fish, John A., Boston.
Foster, F. W., Boston.
Goodrich, J. A., New York.
Harding, James A., Boston.
Hart, L. H., New York.
Haus, Chas. F., New York.
Hill, Wm. H., New York.
Hopkins, Chas. S., Rochester, N. Y.
Hunting, Alfred A., Boston.
Jelley, Stewart A., Philadelphia.
Light, Maj. H. K., Saginaw, Mich.
Lincoln, Chas. C., New York.
Longenecker, C. K., New York.
Mackay, W. M., New York.
McMannis, Wm., New York.
Munro, Edw. A., Brooklyn.
Munroe, Robt., Pittsburg, Pa.
Onderdonk, Chas. S., Philadelphia.
Paul, A. G., Boston.
Quay, D. M., Chicago.
Russell, Wm. A., New York.
Semlay, N. G., Brooklyn.
Seward, P. H., New York.
Sherman, Leroy B., New York.
Smith, F. P., New York.
Stangland, H. F., New York.
Stoughton, Jos M., Yonkers, N. Y.
Tompkins, S. D., Jersey City.
Wilkinson, W. H., New York.
Wilson, J. J., Troy, N. Y.
Weymouth, G. H., Brooklyn.

The President:—Next in order is the reading of the minutes of of the previous meeting.

upon Mr. Jellett, who presented the topic, to open the discussion.

Adjournment to Wednesday morning followed the discussion of the sixth topic.

MORNING SESSION. SECOND DAY.

The meeting was called to order at 10:35 A. M., on Wednesday, January 23rd, by President Bates.

The President :—I wish at the opening of this session to make a little correction. I will ask our stenographer to take this. In our deliberations yesterday there was a little tendency to belittle the architects. Gentlemen, this is wrong. You would not be here if it was not for the architects. There would be no use for you. I can take you down to the North River and put you on board a steamer and in a week I can land you in a country where there are no architects, and where there are no heating or ventilating engineers either. Now we do not make the architect. The architect made us. When a man gets to a point where he says I was a man before my mother, he is treading on uncertain ground. Let us treat the architects with all the respect that is due to them and their profession. We are largely dependent on them for our business, those of us who are in business. Those of us who make a specialty of heating and ventilation from the professional standpoint only are largely indebted to the architects. We might as well look at this thing from a rational standpoint. You take the best architects in the country—they do not tell you that they know everything. As I understand it they take the position of the general of an army. An owner goes to them and says, "I wish to construct a certain device; I wish to occupy so much ground and invest a certain amount of money. In order to do this I must employ 10, 20, or 50 different trades to construct this device." But all of this goes through the hands of the architect, and that is right. If he is a broad-gauged man of experience, he will come to one of our profession and employ him to look after the heating and ventilation of the building. He goes to the best plumber he knows of and gets a system of plumbing. He goes to an experienced roof man and gets his idea of roofing, and so on through the different trades. He combines that information and gives it to the owner, and he puts up a magnificent structure that we are all proud of. We are all proud that we had something to do with that structure. It is a credit to every mechanic who worked on it. It is a credit to the achitect. It is a credit to the city in which it is built. It is a credit to the

whole world. Let us in our future deliberations, if we speak of architects, let us speak of them in such a way as their profession demands, with the greatest respect and condescension, and I will ask the newspaper men here present and our own stenographer, with your permission, to eliminate from their notes anything that has been said here that would tend in any way to belittle the profession of architecture. I will ask you further in your deliberations to make good choice of your language. We are not here as tradespeople. We are not here to force goods on the market, or cry down any other person's goods—nothing of the kind. We are here to talk about theories. We are here to tell of practical results which we may have obtained in experience. You are not here to speak of anybody else in a way that will belittle him or his goods or his practice. Now let us keep on this plane of thought, and it will be an improvement for us all. We are just starting now. Let us start right and hold to the right, and our deliberations here, and our papers, and all that we do, will have a good effect, not only on us, but on the people whom we design to reach.

We have some communications which perhaps had better be presented at this time, if the secretary would read them.

Secretary Hart then read letters of regret from R. C. Carpenter, John Demarest, and W. F. Wolfe.

The President :—Is the nominating committee ready to report?

Mr. Harding :—Yes, sir.

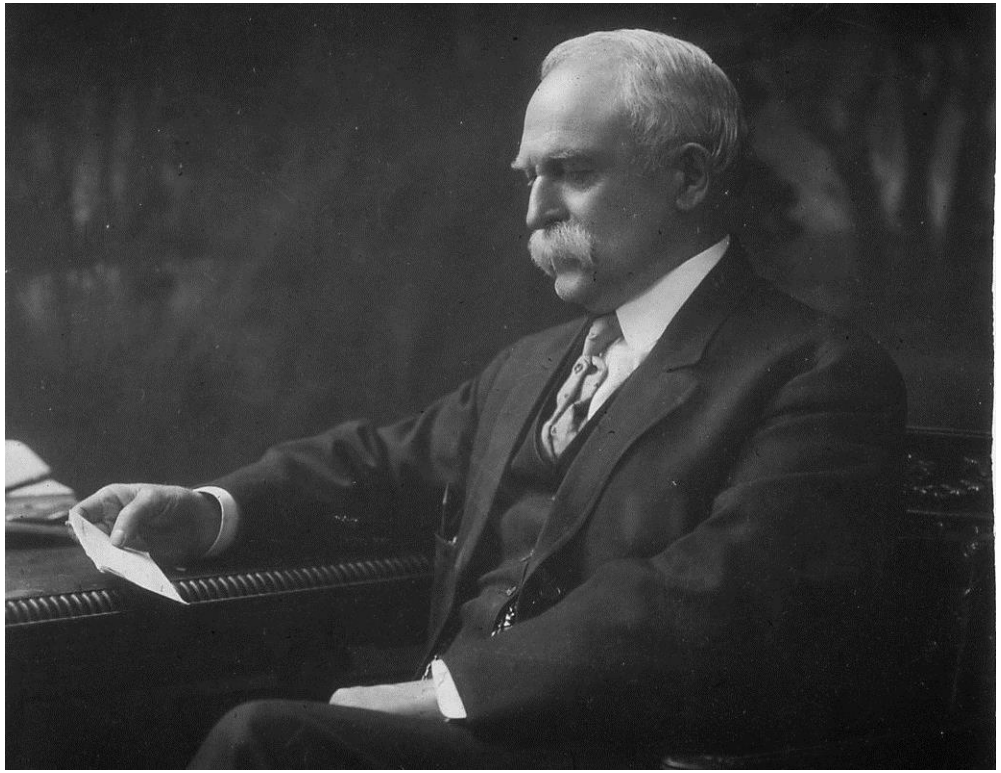
The President :—They will please make their report.

Mr. Harding :—The nominating committee have prepared the nominations for all but the council and the board of managers. Those nominations will be finished immediately after the election of the other officers. I will explain that two candidates are required for each office. The nominations are as follows :

President, Edward P. Bates, Charles W. Newton ; first vice-president, W. M. Mackay, Fred. P. Smith ; second vice-president, Charles S. Onderdonk, H. D. Crane ; third vice-president, Stewart A. Jellett, T. J. Waters ; secretary, L. H. Hart, Edward A. Munro ; treasurer, J. A. Goodrich, George B. Cobb.

Mr. Jellett :—If it is in order I would like to withdraw my name as a candidate for office. I do not care to stand for it at all. I am very much interested in matters in connection with the society. I will be just as much interested in the rank and file as if I were an officer. I have more to do as a rule than I well can attend to. I think there are some men here older and more experienced whom it would be more fitting to place in that position. I should consider it a favor if that request be considered.

Nathan Ricker University of Illinois Architectural Engineering 1870-1920



“building science”
Max Abramovitz, 1949

MAX ABRAMOVITZ: Actually, I am very concerned that the science of building is going to disappear. I wonder if you realize how very few men are left today who are expert in building science. They are very rare and they are passed around among the large offices. You have to dig them out of their holes and revive them. One of them in our office is eighty years old. He passed out the other day and we had to pump stuff into him to get him going again because we couldn’t spare him. It sounds like a joke, but we also have one who gets drunk every third day, but we can’t fire him.

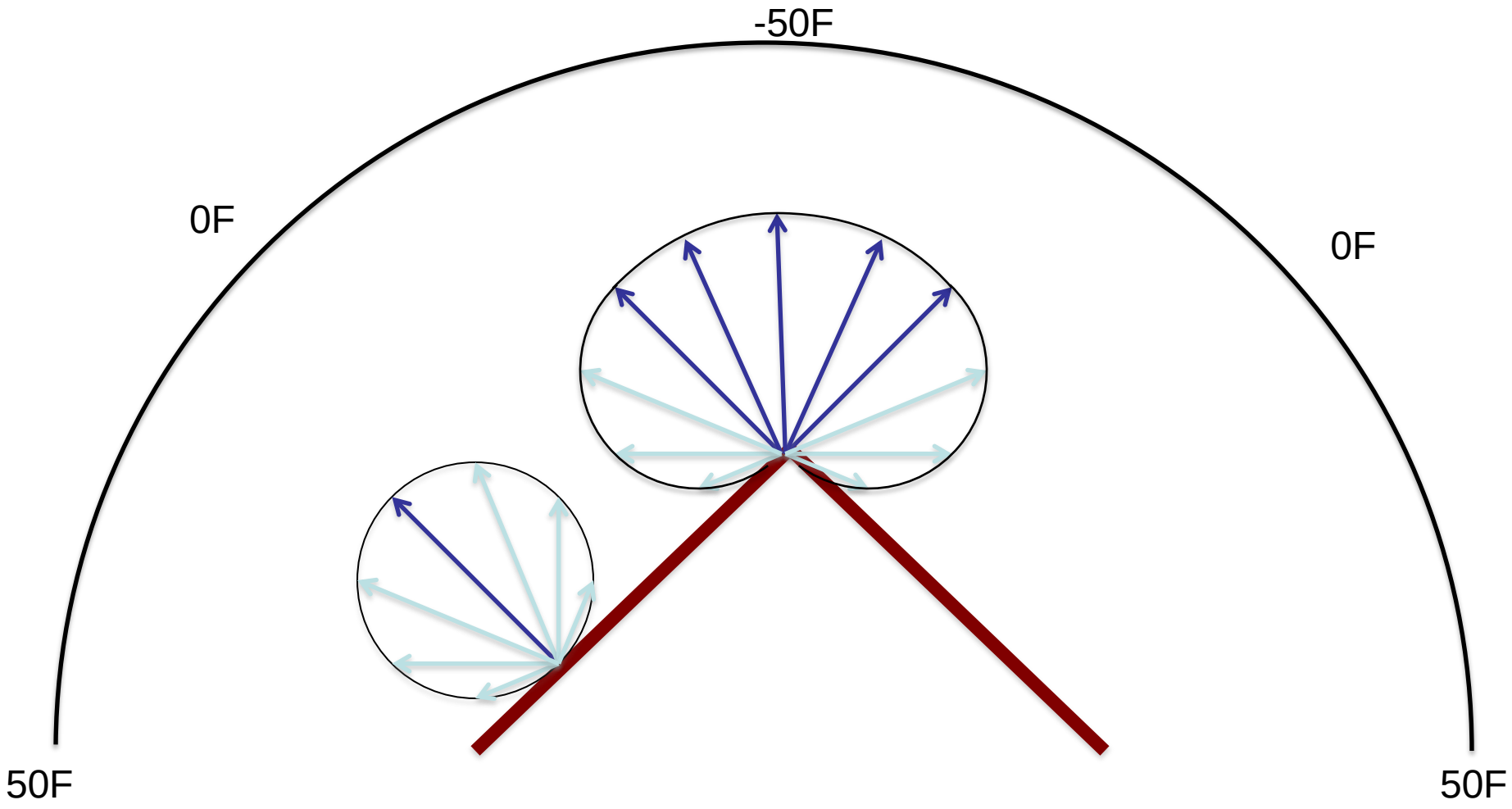
Proceedings of the **University of Illinois Conference on Architectural Education**, February 21, 22, 23, 1949. p. 134.

Corners and pointiness

- During the “solar scare” of the 1970s…
- Are there corner problems? Can corner problems be addressed with flow analysis?
  - Exposure
  - Structure
  - Isotherms
  - Conductive air film
  - Radiant exchange
- Cacti and corn

Temple of Portunus

Possible clear-sky temperatures



Radiant heat transfer is a function of ΔT_{abs}^{4}

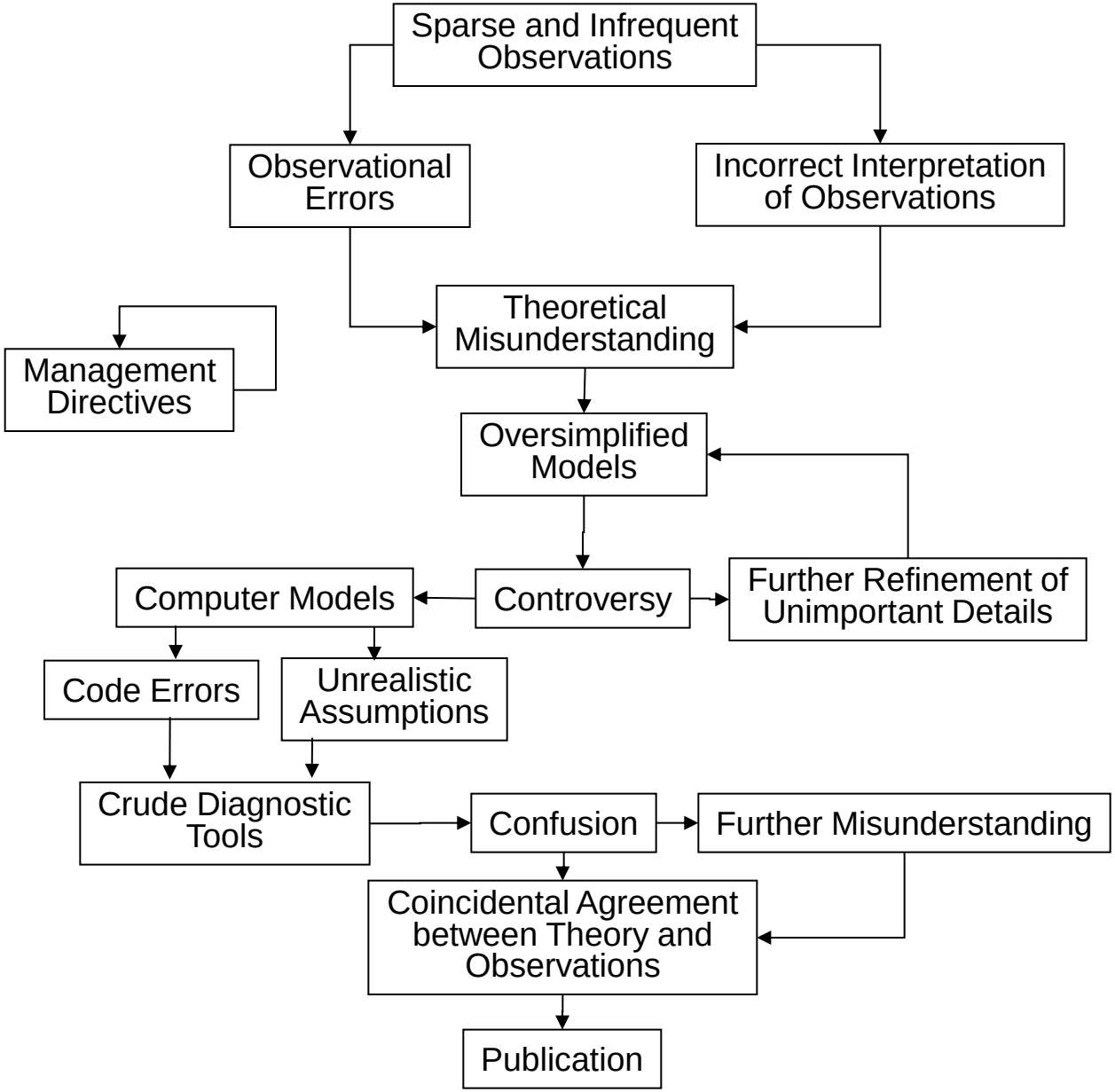
Corn in a drought

Is building research possible?

- How many degrees of freedom in building construction?
- Typical paradigm:
  - Palmiter
  - Alternative paradigms: Surgery, veterinary medicine

Building Science Flow Chart

Larry Palmiter



Parts of building science

Observations

Guidance values

Measured values

Modeled values

- Observations to guidance values: Weak point. Guidance values often conservative.
- Measured values to guidance values: often requires confirmation with observations.
- Modeled to measured: solid, if occasionally tweaked.

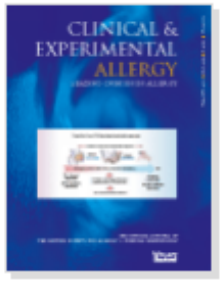
- My recommendation: observe.

Building science and health

- Asthma and allergy
  - Learning from Karelia
- Linear no threshold (LNT) assumption
  - Lead
  - Radon

Clinical & Experimental Allergy Explore this journal >

Open Access Creative Commons



View issue TOC
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Pages 891–901

Opinion

Hunt for the origin of allergy – comparing the Finnish and Russian Karelia

T. Haahtela ✉, T. Laatikainen, H. Alenius, P. Auvinen, N. Fyhrquist, I. Hanski, L. von Hertzen, P. Jousilahti, T. U. Kosunen, O. Markelova, M. J. Mäkelä, V. Pantelejev, M. Uhanov, E. Zilber, E. Vartiainen

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Cited by: 4 articles Citation tools

Am score 4

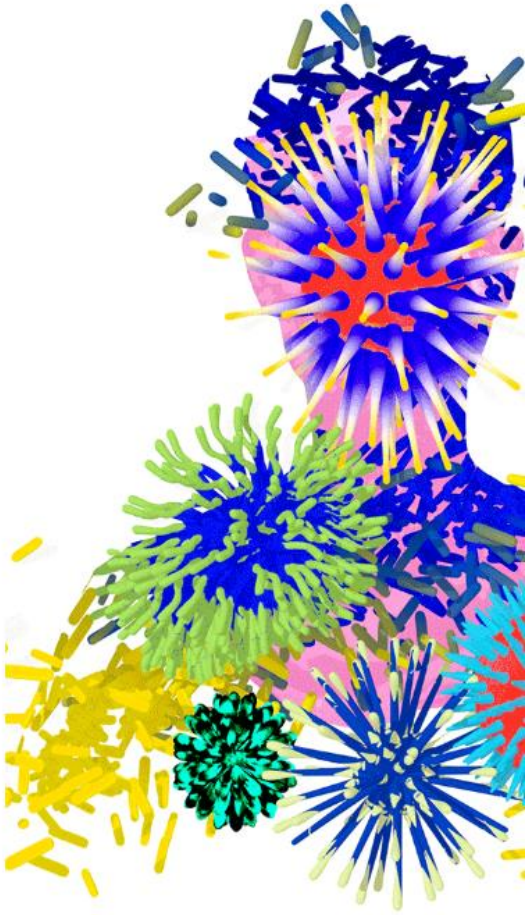
Funding Information

Summary

The Finnish and Russian Karelia are adjacent areas in northern Europe, socio-economically distinct but geoclimatically similar. The *Karelia Allergy Study* was commenced in 1998 to characterize the allergy profiles in the two areas. Allergy prevalence had increased in Finland since the early 1960s, but the situation in Russia was unknown. The key finding was that allergic symptoms and diseases were systematically more common in Finnish children and adults than in their Russian counterparts. For example, in the early 2000s, hay fever in school children was almost non-existent

The New York Times | OPINION

Educate Your Immune System



Our bodies are confused by this 21st-century world.

By MOISES VELASQUEZ-MANOFF JUNE 3, 2016

IN the last half-century, the prevalence of autoimmune disease — disorders in which the immune system attacks healthy tissue in the body — has increased sharply in the developed world. An estimated one in 13 Americans has one of these often debilitating, generally lifelong conditions. Many, like Type 1 diabetes and celiac disease, are linked with specific gene variants of the immune system, suggesting a strong genetic component. But their prevalence has increased much faster — in

RECENT COMMENTS

Miriam June 5, 2016
I'd like to know about variables su exposure to cell phones, compute organic vs standard western...

Radon, principal resources

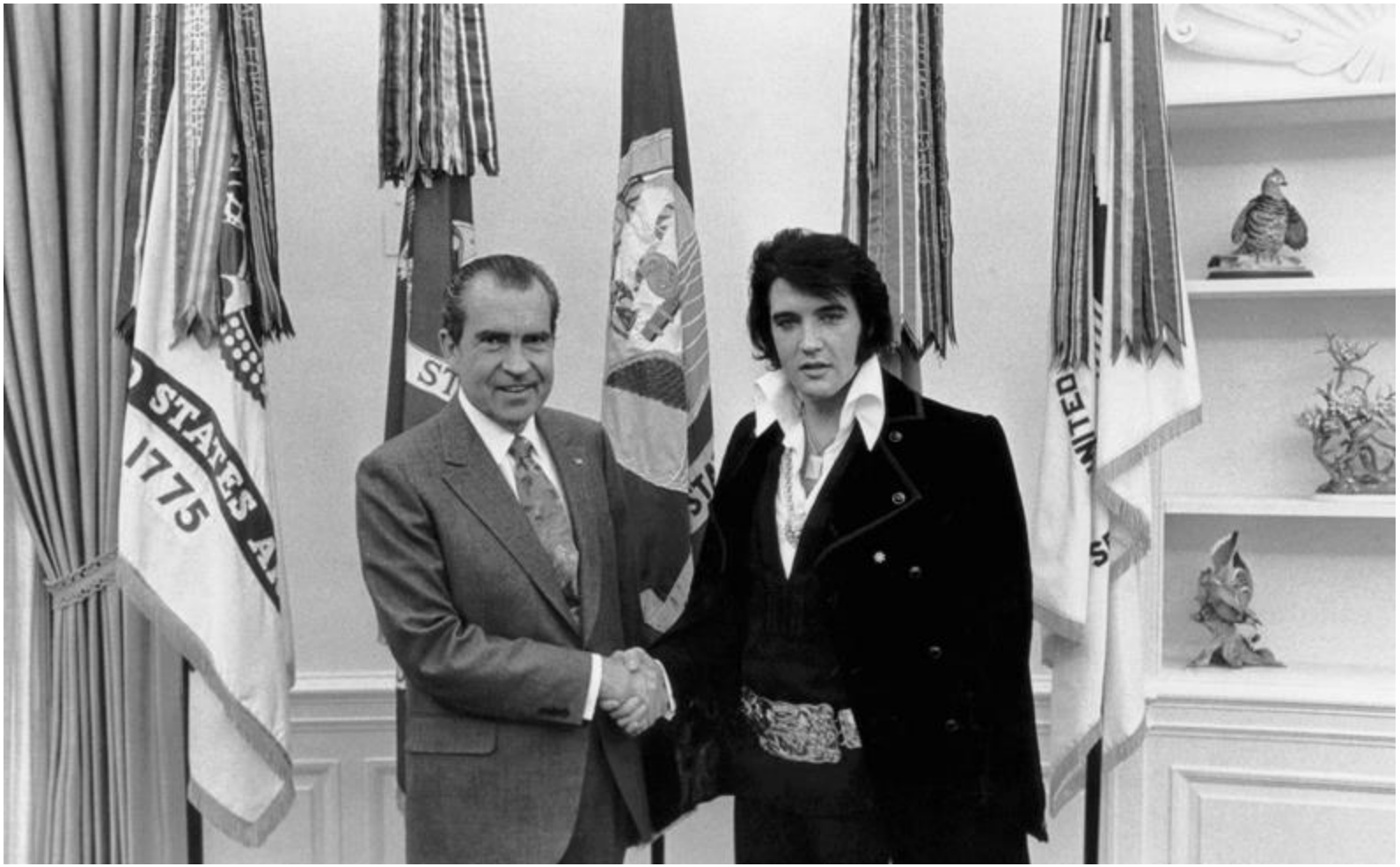
- EPA recommendations: http://www.epa.gov/radon/
- BEIR VI report, 516 pages in support of EPA position: http://www.epa.gov/radon/beirvi.html .
- Report by Field (Iowa) claiming findings in support of positive relation between low-level radon and lung cancer. http://radsci1.home.mchsi.com/irlcs.pdf
- Cohen (University of Pittsburgh) showing negative correlation results (radon and lung cancer) using EPA data in “ecological” study: http://www.youtube.com/watch?v=G1sUz8u_SL4

- Competing epidemiologies criticize competing analyses, not underlying data.

Building science and what's to come

- 1970

Richard Nixon



1970

- http://www.slideshare.net/whitehouse/august-1970-environmental-quality-the-first-annual-report-of

The newly aroused concern with our natural environment embraces old and young alike, in all walks of life. For the young, it has a special urgency. They know that it involves not only our own lives now but the future of mankind. For their parents, it has a special poignancy—because ours is the first generation to feel the pangs of concern for the environmental legacy we leave to our children.

At the heart of this concern for the environment lies our concern for the human condition: for the welfare of man himself, now and in the future. As we look ahead to the end of this new decade of heightened environmental awareness, therefore, we should set ourselves a higher goal than merely remedying the damage wrought in decades past. We should strive for an environment that not only sustains life but enriches life, harmonizing the works of man and nature for the greater good of all.

Richard Nixon

THE WHITE HOUSE, *August 1970.*

Man's Inadvertent Modification of Weather and Climate

MAN MAY be changing his weather. And if he is, the day may come when he will either freeze by his own hand or drown. The delicate balances within the atmosphere and the history of climatic change in the past suggest that through his inadvertent actions he may be driving the atmosphere either to a disastrous ice age—or as bad—to a catastrophic melting of the ice caps. Either may literally be possible, but it depends on just what he is doing to the atmosphere. He does not know for sure.

Evidence continues to build that his activities and his growing populations alter the chemical composition of the earth's atmosphere and change its heat balance. And in turn these two alterations, in tandem, change weather and climate. But the processes and outcomes of such changes are largely unknown.

The science and technology of weather modification are only in their infancies. But they could grow overnight if man will increase his efforts to learn what he is inadvertently doing to his own atmosphere.

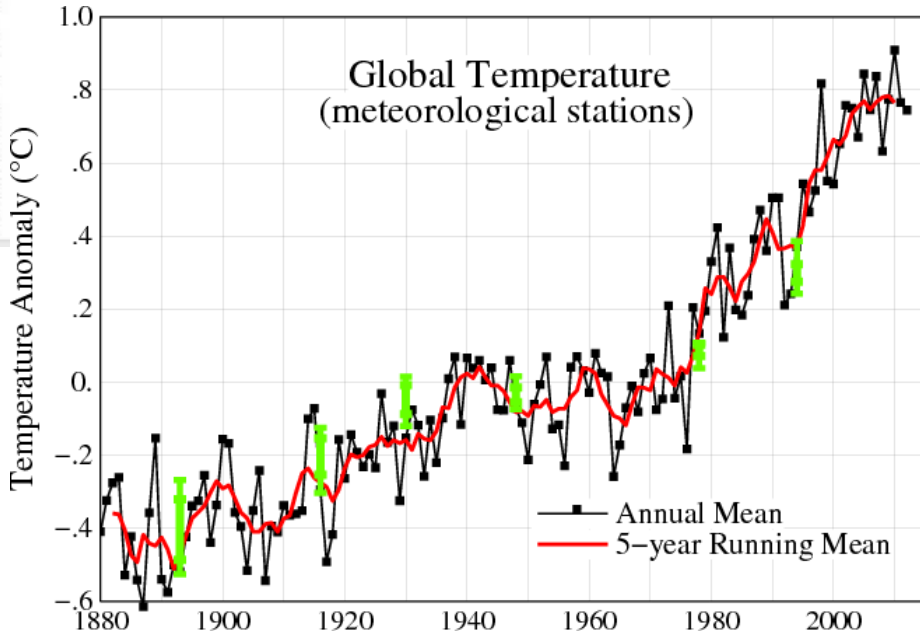
CLIMATIC CHANGES OF THE PAST

Geological and historical records clearly show that major climatic fluctuations have taken place down through history. Since the last advance of the ice sheet in Eurasia about 10,000 years ago, the permanent ice cover in the Northern Hemisphere has been limited largely to the Arctic Ocean, Greenland, and some high latitude islands.

But alternating periods of warming and cooling have occurred during the last 10,000 years. In the last century, instruments have been available to keep current records, and they show a pattern of climatic fluctuations.

Climate is much too complicated to be described by any single parameter. One useful guide is the average annual temperature at the earth's surface. Beginning in about 1890, this average temperature began an irregular climb. By 1940, it was 1.1° F. higher than it had been during the decade from 1880 to 1890. But in the 30 years from 1940 to 1970, the average temperature has fallen about 0.5° F. Thus, during the last three decades, one-half of the warming that occurred during the preceding six decades has been erased.

Associated with rising temperature in the Northern Hemisphere were movements of the frost and ice boundaries. Simultaneously, pronounced aridity gripped the south central parts of Eurasia and North America. This led to dust-bowl conditions in some areas and a northward displacement of the polar fronts. The recent lowering of the temperature has been accompanied by the shifting of frost and ice boundaries to the south and marked increases in rainfall in parts of previously arid continental regions. In the last two winters, ice



Carbon Dioxide—An Earth Warmer?

The atmosphere's energy, which determines weather and climate, is derived primarily from visible solar radiation absorbed by the earth's surface and atmosphere. The absorption of that energy tends to raise the temperature at the surface. The earth's surface maintains its thermal balance (keeps from overheating) by radiating energy back to space at longer wavelengths. Carbon dioxide in the atmosphere absorbs incoming visible radiation, but in amounts too small to have any appreciable effect on the radiation reaching the lower atmosphere and the earth's surface. However, carbon dioxide is virtually opaque to some long-wave radiation that is emitted by the earth's surface. Thus, when carbon dioxide concentrations increase, heat loss through radiation from the surface is reduced—the "greenhouse" effect.

Any attempt to extrapolate the future effect of carbon dioxide on climate must be uncertain because the fraction of carbon dioxide that will enter the ocean is unknown. If 60 percent of the emissions of carbon dioxide remains in the atmosphere and there is a 5 percent yearly growth of fossil fuel consumption, then by 1990 there would be about 400 parts per million in the atmosphere. If this were not offset by other activity, then the earth's average surface temperature would increase by 1.4° F. On the other hand, if 40 percent of the artificially produced carbon dioxide enters the atmosphere and the present 4 percent growth of fossil fuel consumption continues, then a level of 400 parts per million will not be reached until about the year 2010.

Particle Pollution—An Earth Cooler?

A human activity which may accelerate temperature drops—and thus help compensate for any carbon dioxide-generated temperature rise—is the injection of small particles into the atmosphere.

Certain kinds of industrial processes emit cloud condensation nuclei (small particles around which raindrops can form). This affects the frequency of fog and low cloud layers. These in turn influence the radiation that reaches the earth from the sun. Forest fires also produce cloud condensation nuclei (from dust and ashes) plus large quantities of heat and water vapor. Large-scale burning of forest refuse and accidental forest fires, which are particularly common in the Western States (but less prevalent than in the past), might modify climate and weather over large regions in this way. The net effect depends on the abundance, size, distribution, and altitude of the particles. Some investigators estimate that a decrease of atmospheric transparency of only 3 or 4 percent could lead to temperature reduction of 0.7° F. Another study shows that the addition of 1 percent in the world's average low cloud cover lowers temperatures by 1.4° F. This is almost three times the decrease measured in the last two decades. On the average, about 31 percent of the earth's surface is blanketed by low clouds. If this figure were to reach 36 percent, and there is no evidence

If energy consumption continues to increase at the present rate of 4 percent per year, then in 200 years artificial energy input into the atmosphere would equal one-third of the natural radiation balance. This level would be reached in only 100 years with a 10 percent yearly increase. These numbers are highly significant because an increase of a few tenths of 1 percent in the radiation balance, if long sustained, would cause polar ice to disappear completely unless other natural or manmade changes compensated for the energy gain.

The combined effect of carbon dioxide pollution and heat pollution is strongly in the direction of warming the earth's atmosphere. Particle pollution tends to lower the earth's temperature. Which pollution effect will ultimately dominate? Will we indeed drown or will we freeze? Despite firm predictions by some ecologists, we do not know the answers. Careful monitoring and extended research are required if we are to manage our global climate wisely. These questions may become critical in the future.

CONCLUSIONS

Examination of how man can change climate on a large scale leads to these conclusions:

- The chemical composition of the earth's atmosphere has been altered by man in a measurable way. Some of these changes, which have been mostly inadvertent, have only recently been recognized.
- The magnitude of these atmospheric changes is enough to alter the earth's surface temperature slightly. Carbon dioxide added to the atmosphere from burning fuels is sufficient to lift the average temperature by several tenths of a degree Fahrenheit. Other factors, however, have caused world temperature to drop slightly in the last 30 years.
- These changes in the atmosphere cannot be regarded as local. Heat input escaping from a city into the atmosphere changes the climate of that city. The combined effects of many cities may eventually alter regional and global climates.
- Enough is known about the physical environment to establish the fact that inadvertent modification is occurring. But not enough is yet known to predict all the consequences of atmospheric changes confidently.
- Despite its importance, research on inadvertent climate modification has been neglected. Only about 1 percent of Federal Government research monies for weather modification go to programs investigating man's inadvertent modification.

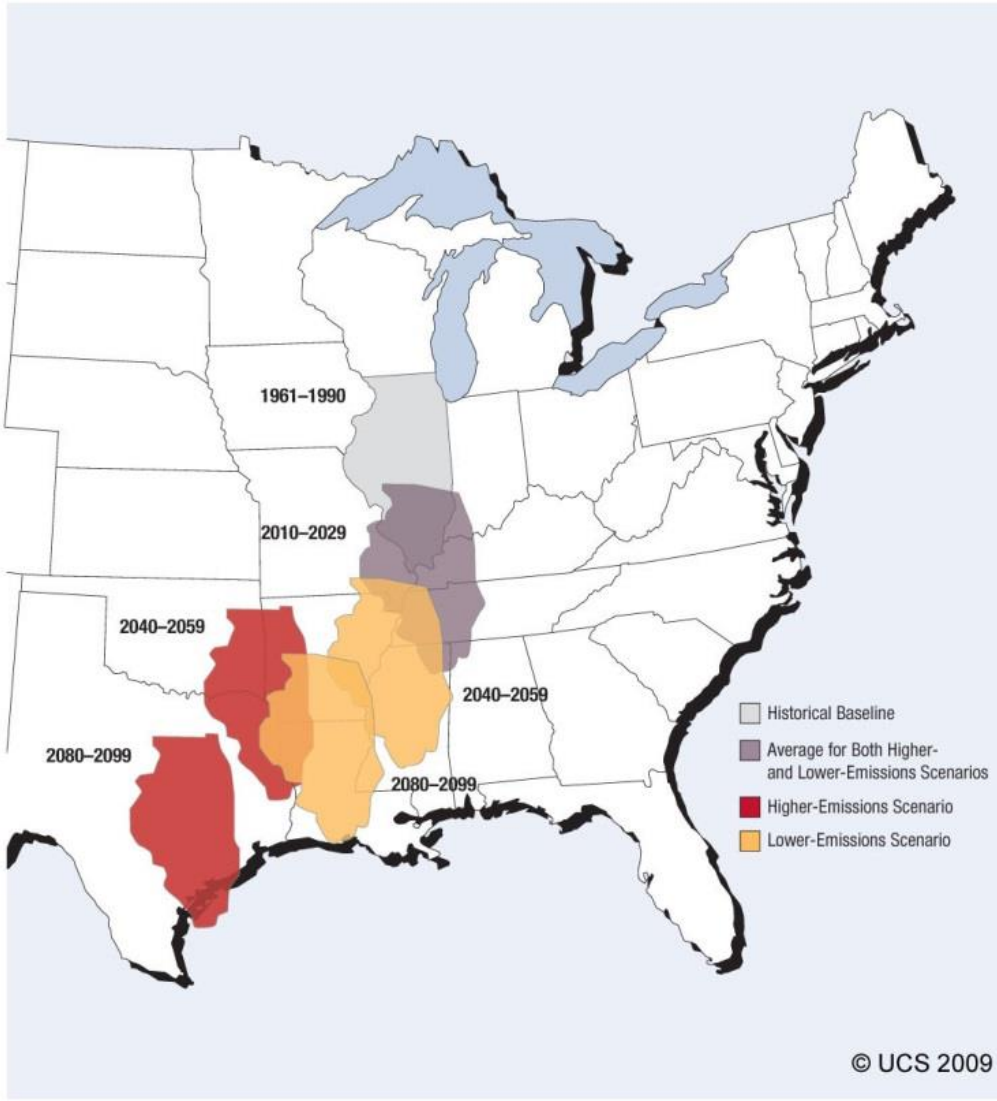
Uplifting final words

- Who we are

Heinz Trechsel -2016

Welcome
Clearwater 2016

William B. Rose
University of Illinois at Urbana-Champaign



Illinois' Climate Migrates South

Changes in average summer "heat index"—a measure of how hot it actually feels based on a specific combination of temperature and humidity—could strongly affect Midwesterners' quality of life in the future. For example, the red outlines track what summers in Illinois could feel like over the course of the century under the higher-emissions scenario; the yellow outlines track what summers could feel like under the lower-emissions scenario.