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19th National Forum on Quality Improvement in Health Care
Institute for Healthcare Improvement, Orlando, Florida, 12 December 2007

Health care: some analogies, lessons, and ideas from energy

With grateful acknowledgement to Russell Jaffe MD PhD, Jay Ogilvy PhD, & Donald Berwick MD MPP for many insightful writings and comments (but I alone am responsible for this content)

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Disclaimer

- Beginner's mind: this is my first talk on health care
- I haven't formally studied medicine or health care, and am expansively ignorant of both
- My main work is in whole-system design for radical energy and resource efficiency in buildings, factories, vehicles,… and in redesigning complex systems
- I can give you expert advice about creating abundance by design, but not about health care
- Don invited me just to ask you some different questions and to be provocative
- Please forgive and instruct me if I get it wrong

My wonderings in the medical bewilderness

- Sickly child, colicky, agammaglobulinemic to age 10, twice saved by penicillin & superb pediatrician
- 100 days/year mountaineering ~1965–80
- Gradually discovered integrative modalities
- Decades of antioxidant regime and robust health
- Belatedly realized orthopedics is a proactive art
- Past few years' exceptional well-being with systematic high-quality supplementation, which (chiefly via soluble quercetin dihydrate + soluble OPC) promptly cured 27 years' chronic knee synovitis and my wife's 10 years' arthritic neck pain
- In 2007, corrected chronic metabolic acidosis, restored buffering capacity via alkalinizing diet, and began rebuilding previously resorbed bone

Dis-integrated knowledge: a few anecdotes to show my biases

- Does your optometrist routinely ask what meds you're on?
- The surgeon and the acupuncturist
- The molar, the osteopath, and the sinus
- The same molar and the dentist
  - How did correct observation turn into canonical misinterpretation?
  - Maybe the dentist doesn't see enough well people to spot one who walks in
  - How did a curious and excellent clinician neglect to note the history?
- Four recent encounters with routinized "standard of care"
  - Antibiotic and superinfection
  - Antibiotics for two female urinary tract non-infections
  - Antimalarial precautions (Lariam, Malarone, or doxycycline—presumes compromised host, but without probiotics, creates hospitable host)
  - Annual flu shots—in *my* state of health, all vaccines are contraindicated
- One office visit, five brief questions, five office-visit bills
- Outpatient surgical procedure, pay cash, get a 50% discount

Where did it start? Some basic flaws in U.S. medical education

- Stephen Schneider's *The Patient from Hell* reveals most of his excellent Stanford physicians' ignorance of Bayesian statistics
- Double-blind (& RTC) fetishism (it is "to actual clinical practice what the study of monkeys in a cage is to their behavior in the forest"—Abram Hoffer)
- Robert A. Nagourney's highly successful *in vitro* cancer diagnostics (www.rationaltherapeutics.com) applies the therapy that *your specific* cancer likes least; why's that considered heretical?
- What did *your* medical education tell you about the therapeutic value of nutrition, exercise, home birth and death, breast-feeding, acupuncture, therapeutic massage, osteopathy, homeopathy, chiropractic, meditation, visualization, etc? When did you start recommending and integrating them?
- Did you master the basics, like physiology and biochemistry?
- Did you learn to engage human healing responses?

Dr. Mendelsohn's view (1979)

"The admissions tests and policies of medical schools virtually guarantee that the students who get in will make poor doctors….Medical school does its best to turn smart students stupid, honest students corrupt, and healthy students sick."

—*Confessions of a Medical Heretic* (1979), p. 130

So, not surprisingly, doctors' strikes (for all but emergency services) are curiously correlated with sharply lower death rates, as in Bogotá 1976, Israel 1953 & 1973,…

—*Id.*, p. 114

Dr. Mendelson's proposed New Medical School would include…

- A Department of Ethics and Justice: "A community's concept of justice determines the health of its members ….A free enterprise system saturated with justice can provide good medical care, while a socialized medical system devoid of justice can provide deadly medical care."
- A "very strong Department of Iatrogenic Disease" where all medical disciplines and specialties "will be required to demonstrate how their methods can produce disease and disability. Doctors and professors will be paid to find out how medical care does more harm than good, and how proposed new treatments might prove harmful."
- Strong emphasis on generalism: the whole school is "an open forum of ideas on healing," often taught by practitioners of alternative modalities

— *Confessions of a Medical Heretic* (1979), p. 181

Mal-selection and mis-education—industrializing the healing arts

- How can medical schools stop choosing and graduating uncaring, unsocialized jerks who infantalize patients? (Phyllis Hollenbeck MD's *Sacred Trust*)
- How can we get more doctors who…
  - enculturated by liberal arts, use both sides of their brain?
  - apply individualized critical thinking, not rote practice guidelines, and refuse to become prescription-writing cogs?
  - make patients comfortable enough to tell their story?
  - know that "history is 90% of the diagnosis"?
  - take the time each patient needs? reads faces, not just charts?
- How can we restore medicine to a culture of curiosity and discovery, with vision across boundaries, seeking "patterns that connect"?

Why Phyllis Hollenbeck MD is a "shameless primary care chauvinist"

"A young woman goes to see a doctor because of nausea.

The neurologist wonders if she hit her head and offers a CT scan.

The gastro-enterologist suggests that she let him put a scope down and take a look at her gut.

And the family physician takes a look at her face and asks:

'What did you eat last night?

Is anyone else in your family sick?

Are you worried about exams?

And when was your last period?'"

—*Sacred Trust* (2005), p. 117

A different kind of medicine

"The art of medicine flows from the physician's ability to be introspective and to understand the patient as a human being with certain feelings, thoughts, attitudes, interpersonal relationships, aspirations, and expectations rather than a mere symptom carrier. Such a physician tends to see the patient, and not himself, as the primary person responsible for maintaining health, by leading a meaningful life in which proper nutrition, exercise, and stress management combine with an appropriate balance of love, play, and work within a harmonious family. Such a physician will resort to drugs or surgery only after his understanding of the patient's predicament has ruled out non-invasive or educational, psychological, or social approaches."

—Leo I. Jacobs MD, quoted by Robert S. Mendelson MD, *Confessions of a Medical Heretic* (1979), p. 175

Energy policy: a multiple-choice test

Would you rather die of:

1. climate change?
2. oil wars?
3. nuclear holocaust?

The right answer, often left out, is:

4. none of the above

Just using energy in a way that saves money will solve the climate, oil, and proliferation problems—not at a cost but at a profit

Health care: a multiple-choice test

Would you rather die of:

1. illness not treated effectively and timely?
2. iatrogeny and malpractice?
3. bureaucratized, institutionalized mediocrity?
4. socialized medicine leading to totalitarianism?
5. medically induced indigence?

The right answer, often left out, is:

6. none of the above

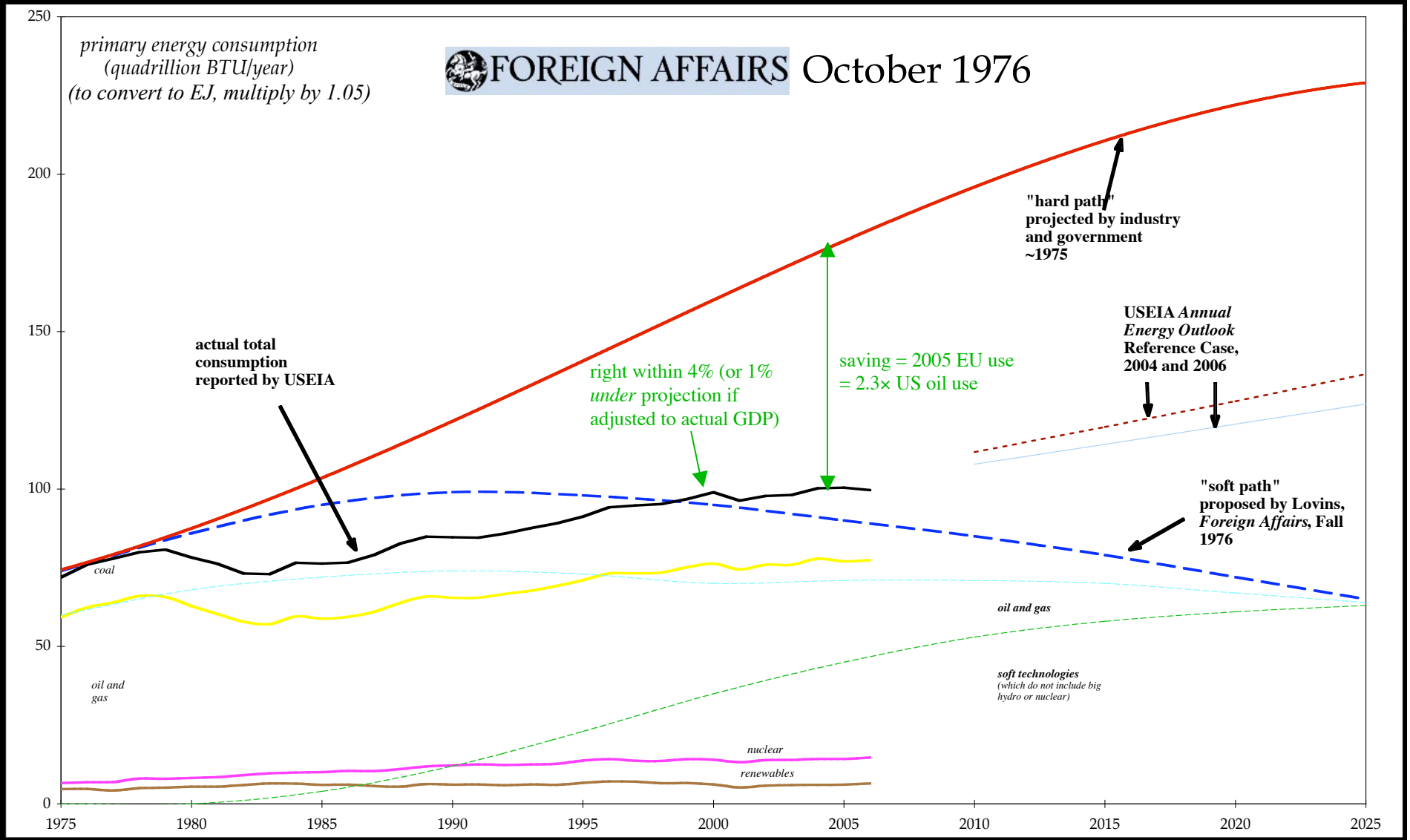
Testable hypothesis: *just using our wits in a way that saves money* can keep us healthy at lower cost than we now pay to treat our illnesses, just by treating causes rather than consequences

Canonical energy dogma, 1975

- Energy and GDP rise forever in lockstep, so using less energy means "caves and candles"
- The aim of energy policy is therefore to
  - *get ever more energy*
  - from any available source
  - in ever higher quality (increasing electrification of all uses)
  - at ever larger scale (only big can be adequate and effective)
  - at any price—whatever it takes

  and any resulting risks or side-effects are to be accepted as the "inevitable price of progress"
- But after the 1973 oil embargo, this system was clearly broken (too costly, slow, nasty, risky), so we had to start *asking different questions*

US energy/GDP already cut 48%, to very nearly the 1976 "soft path"



but that just scratches the surface, especially for el. and oil

New questions, new answers

My 1976 "soft energy path" essay redefined the energy problem as:

How much energy, of what quality, at what scale, from what source, could do *each desired task* in the *cheapest way*?

This heretical "end-use/least-cost" approach, at first strongly criticized, was accepted within a decade as the way "smart energy firms" try to foresee and shape their future, starting with *end-uses*:
For what *tasks* do we want energy?

Is *more energy supply and use* really the goal?

Average Danish per-capita kW of primary energy used to heat & cook

~1500: 0.9–1.9
1800: 0.9
1900: 0.4
1950: 0.9
1975: 2.3

- Do the 1900–75 data mean Danes just regained the prosperity they enjoyed in the Middle Ages?
- 1500–1800, inefficient wood and peat fires;
  1900, fairly efficient metal or ceramic stoves;
  1950, mainly oil but in *inefficient* furnaces;
  1975, often electric resistance heat (~4× usage)
- How much cooking they did was almost unrelated to the primary energy they used

So what do we want energy *for*?

- Energy is only a *means* to achieve other ends
- What we want is the *services* energy performs
  - *E.g.*, hot showers and cold beer (or the opposite in the UK)
  - Mobility, warmth or coolth, cooking, visibility, torque, …
  - …in order to get to where we want to be, feel comfortable, prepare food, read, run machines to make stuff we want,…
  - …in order to achieve, we hope, happiness and satisfaction
    - But note that very efficiently providing something we don't want, like junk mail, doesn't make us better off!
- Surprisingly often a *cultural* variable
  - Many Americans turn on every light when entering a room
  - Many Europeans turn off the car's ignition at every stoplight
  - A Japanese person, asked why the house isn't heated in winter, may reply, "Why should I? Is the house cold?"

Energy efficiency delivers more ends with fewer means

- Substituting brains for BTUs, design for dollars:
  - extracts more fuel or more renewable energy flow from less resource use
  - loses less resulting energy in processing/delivery
  - wrings more *service* from *less* delivered energy ("end-use efficiency")
  - and may better match delivered services to the kinds and qualities we want for the most happiness and satisfaction!
- The U.S. quietly halved its primary energy per $ of real GDP since 1975; this "intensity" fell 4% last year alone (more than GDP grew)
- Available *untapped* efficiency can save half U.S. oil and gas, and three-fourths of electricity, at one-sixth today's average cost of buying them

Of all energy options, end-use efficiency is by far the …

- Biggest
- Cheapest
- Fastest
- Most benign
- Least visible
- Least understood
- Least well measured (in most places)
- Most neglected in policy
- Most underinvested-in
- Most overlooked when assessing the competitive landscape on the supply side

So the energy mess isn't caused by a lack of knowledge, but by simple failure to apply what we know. Just like health…

Sounds like Integrative Medicine! So what's the health care analogy?

- Do we want *more energy*—or more and better *services* with *less* energy? Did our energy use measure our success—or our *failure* to get the services we wanted with an elegant frugality of means?
- Is the aim of health care policy really to get *more health care*—or *better health* with *less care—i.e.,* higher "medical end-use efficiency")? Are more doctor visits, hospital days, tests, and procedures a measure of success…or of failure?
- And isn't providing each energy service in the cheapest way analogous to trying first those therapies with the highest potential effectiveness, least risk, and least cost?
- If so, let's return to first principles:

Focus on what we want: health

- The *health* conversation is nearly all about its *absence* (disease), not its affirmative *presence*
- Lamenting what we don't want (illness) and why we have it is less effective than exploring what we do want (health) and how to get it —Sat Santokh Khalsa
- A head of the American Psychological Association, in his inaugural lecture, reportedly noted that its members had produced 30,000–40,000 papers on grief and despair, but only 300–400 on happiness and joy; he suggested that if members wanted to help people achieve happiness and joy, they were looking in the wrong places —Sat Santokh Khalsa
- Raymond Williams: "To be truly radical is to make hope possible, not despair convincing"

Conventional and Integrative medicine

(adapted and paraphrased from Russell Jaffe MD PhD *et al.*, "An Equation of Health," *J. Mgt. Devel.* **26**(5):441–458 (2007), www.emeraldinsight.com/0262-1711.htm)

Basis of practice: disease care

- Health care described in terms of ill health present, measured by symptom descriptions
- Individual treatment success measured by abated symptoms
- Preventive medicine means early detection and treatment of illness
- Resources used chiefly to treat disease, not promote health
- Equates medical care (inter-ventions) with health
- Relies chiefly on sublethal doses of lethal medicines

Basis of practice: good health

- Health care described in terms of health enhancement, quality of life, or well-being present, characterized by vitality or by the presence of causes of and absence of risks to good health
- Individual treatment success measured against the patient's full potential for well-being
- Preventive medicine & health promotion framed in proactive, reinforced/incentivized actions
- Resources used to promote healthy choices and habits during all phases of life

Conventional and Integrative medicine: some consequences

- Priorities focus on disease expression (~99%) rather than on monitored and measured health enhancement (~1%)
- Prevention is more noble goal than integrated priority
- Research/treatment priorities based on diagnosing/treating illness
- Outcomes measured by short-term, dependent variables; persons described in terms of symptoms/*disease expression*
- Symptom absence is health's measure
- Selective opacities encouraged

- Priorities focus on diagnosing & treating, improving, or re-storing health—eliminating host susceptibility & hospitality to ill health, enhancing repair
- Independent or intervening variables of functional health are assessed in terms of risk reduced or well-being attained
- Individuals' *health expression* is compared to *themselves*
- Functional outcomes assessed in terms of wellness, QOL, and high-quality health measures
- Transparency encouraged to document health attained

Universal care (with or without single payer): a moral imperative

- As FDR said in 1937, "We have always known that heedless self-interest was bad morals; now we know that it is bad economics"
- Practiced today, at lower overall cost and with generally good (often better) quality, by all other wealthy countries—and by our own VA
- Necessary *but not sufficient*:
  making sickness care (*but not health-restoring and -sustaining choices and habits)* accessible to all simply perpetuates the fundamental illusion that health can be bought—that money is the answer, and if we're not healthy, it's because we're not spending enough

So we present with a fully metastasized economic carcinoma, already causing cachexis: *e.g.*,

- A soaring $2-trillion annual health care bill, 2–3× the per-capita cost of other rich societies with better observed health outcomes (US is #15–37 of 115 [WHO ’91]; among advanced countries, we spend most, suffer more, and die soonest)
- By “objective but not stringent” metrics (Jaffe), a population of whom only ~5% are healthy and two-thirds have a detected chronic disease, many fast-rising & unheard-of among our grandparents
- An epidemic of epidemics of chronic disease
- Still “spending more and feeling worse” (John Knowles MD, 1978)…with bankruptcy now in view
- Only a complex system full of brilliant and diligent people could have created such outcomes!

The analogy of the arms race

("From the Iron Triangle to the Chrome Pentagon: Breaking the Arms Race in Health Care," Rick Donker PhD & Jay Ogilvy PhD, *Healthcare Forum J*, Nov–Dec 1993, pp. 72–77)

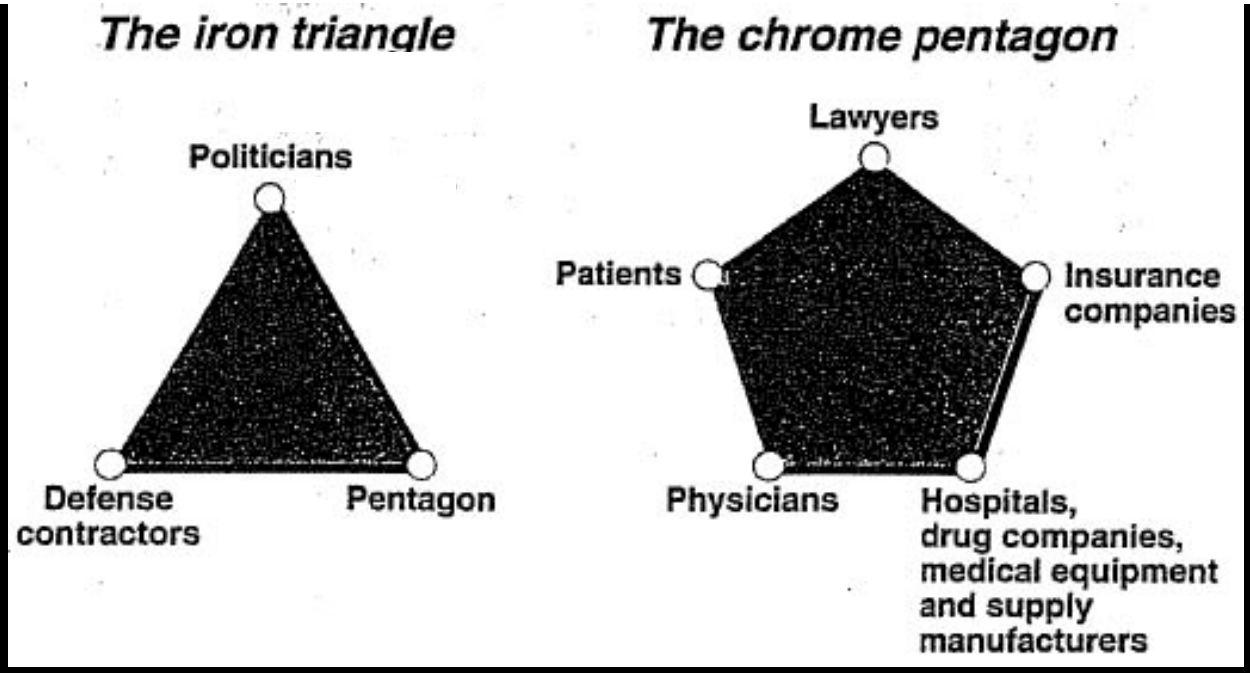
- The U.S./Soviet arms race was driven by a loop of self-reinforcing incentives between the Pentagon, military contractors, and Congress
- This tight collusion of mutual interest—the "Iron Triangle"—was impregnable to reform
- It created ever more, more elaborate, costlier weapons systems: smart and sane people collectively behaved in stupid, insane ways; no bad motives were needed for bad outcomes
- Soviets went broke before U.S. (bad analogy)
- De-escalation requires not piecemeal reform but *reversing the whole circle of incentives*

The medical-industrial complex (*id.*)

- The "chrome Pentagon" or "stainless-steel star" has *five* vertices whose mutually reinforcing incentives *all raise costs*
  - **Physicians:** paid by insurers (and under threat from lawyers), so some incentive to practice defensively, order extra tests etc.
  - **Patients:** little incentive to save—insurers pay—or, if uninsured, can't pay and have almost no market power
  - **Lawyers:** usually paid part of any damages they recover, so rewarded for suing for as much as possible
  - **Insurance companies:** profit from a percentage of cashflow; little incentive to save (esp. if coverage becomes mandatory)
  - **Suppliers** (hospitals, pharma, medical equipment manufacturers)**:** benefit from cost-unconscious patients, defensive doctors, and third-party payers who continue to pay escalating costs
- Many amplifying interactions: drug companies pay doctors to sell drugs, doctors invest in test/treatment facilities to which they refer patients, suppliers scare patients to lobby for inflated payments, FDA tends to suppress independent innovation (albeit often cheap and/or unpatentable), more diagnosis finds more reservoirs of undetected disease, etc

Different details, similar outcomes (*id.*)

- Len Duhl notes that just as the Iron Triangle created DoD's infamous $800 toilet seat, so the Chrome Pentagon turned the pre-Medicare $4 inflatable plastic cushion for paraplegics into a $110–140 item because it was "integrated into a high-overhead system where the incentives were all upward"
- "Large and complex systems of incentives take on lives of their own. Well-intentioned caps on overhead percentages lead accountants to spread real overhead costs over all units of production."
  — Donker & Ogilvy, *id*.
- Efforts to ferret out such anomalies piecemeal only hire more bureaucrats, pushing prices even higher
- "[T]he health care system is rewarded and has much opportunity for being creative in additional billed services as a response to specific cost containment approaches"
  — R. Jaffe MD PhD, *Health Assurance*, Health Studies Collegium



(Donker & Ogilvy, *op. cit. supra*)

Incentives* of the chrome pentagon vs. *payments

	ADMISSIONS	LENGTH OF STAY	ANCILLARY USE
Indemnity, discounted fee-for-service	↑	↑	↑
Per diem	↑	↑	↓
Global/per case	↑	↓	↓
Capitation	↓	↓	↓

↓ *better* —but not good enough… why not?

So why can't the HMO concept easily solve the problem?
(Jay Ogilvy's analysis)

- Original idea had potential to fix perverse incentives
  - Prepaid providers are rewarded for keeping their capita healthy so they use less healthcare and provider keeps more of prepayment
  - Providers should thus invest in restoring and sustaining *health*
  - But in a competitive market environment, HMO-A does so, raising short-term costs; HMO-B across the street doesn't, and skimps on care no more than HMO-A does; HMO-A's customers get healthier but must initially pay more than HMO-B's; then in the medium term, HMO-A's customers switch to HMO-B in search of lower fees, so HMO-B gets healthier lives and more customers while HMO-A is left holding the cost bag for doing the right thing
- This "first-mover disadvantage" results from the lag between investment in and improvement of health, and the even longer lag between failure to invest in health and eventual emergence of costly disease

Proof of this concept: Hawai'i, which mandates near-universal coverage (Jay Ogilvy's analysis)

- Hawai'i Medical Services Association (Blue Cross/ Blue Shield) has ~2/3 market share
  - Main competitors: Kaiser Permanente, which *does* maintain health, and a Catholic system not based on cost-shopping
  - Remote island location discourages United, Humana,… because supply-chain costs depress potential profits
  - Thus HMSA *is* HMO-A *and has no HMO-B*, so it can promote health without getting punished for it
- Result: some of best U.S. health statistics—and HMSA spends more of each dollar on health and less on paperwork than any other BCBS
- Moral: either single payer or universal care is needed to prevent first-mover disadvantage
- Requirement: a well-led, carefully orchestrated, well-financed *political* effort respecting power of (*e.g.*, coöpting) insurers and big pharma firms

But digging deeper reveals a thorny issue... (Jay Ogilvy's analysis)

- Single payer or competitive universal coverage?
  - Free-market fundamentalists will claim that single-payer means a monstrous bureaucracy with lower efficiency & higher cost than a competitive market that drives out those defects (international comparisons notwithstanding!)
  - *E.g.*, Michael Porter, a top competitive analyst, does claim this—but perhaps a half-dozen U.S. markets have the scale to support his competitive, large, vertically integrated systems
  - In smaller markets, competition is *in*efficient and *raises* costs—too much costly equipment—better to cooperate
- We don't know the scale breakpoint
  - But if it's anything like a few big conurbations *vs.* the rest of the country, single-payer would work best in *red* states and competitive universal coverage in *blue* states
  - …which is the opposite of their ideological preferences, making a state or Federal legislative solution impossible!

…rapidly outrunning our knowledge… (Jay Ogilvy's analysis)

- Whether we should use competition or regulated monopoly depends on the product or service
  - AT&T was a regulated monopoly so all phones could interconnect
  - This worked for decades…but ultimately AT&T became a bloated bureaucracy, so breaking it up raised innovation and lowered prices (and also made phones harder to use, bombarded us with offers we can't understand, devastated customer service, etc.)
  - Competition has been helpful on the whole with railways, natural gas, airlines, etc.—though not with electricity, where the deregulators fundamentally misunderstood the business: the "second-best" market-emulating regulated monopoly model was better
  - We're a long way from resolving this choice for health care, either ideologically or empirically
- A social mandate for universal service makes market forces alone inadequate, because we can't allow losers (dead people, illiterate students,…)
- But we don't know what works best in which cases

But we do know that the U.S. health care debate is misdirected

- The system could hardly be designed worse…and reinforces the political power of its beneficiaries
- *But changing administrative and reimbursement mechanisms makes little difference if we still pursue the wrong goals and apply the wrong metrics—disease care, not health gains*
- The current system measures and rewards means, not ends, *and* misdefines the ends
- Just removing specific perverse incentives is like squeezing a balloon—they'll pop out elsewhere if the basic system dynamics don't change
- Fixing parts without changing the whole system and its fundamental goals will do little good

Healthcare, says Dr. Jaffe, *should* mean speeding a transition from:

◇ Caring for consequences to caring for causes
◇ End-stage symptom suppression to prevention, early detection, and health promotion—eliminating host hospitality and susceptibility to ill health
◇ Working *on* people to working *with* people
◇ Rationally deploying healthcare workers/resources
◇ High-tech, -cost, -risk and -morbidity therapies to those that employ "Biologic" (Nutritional, Behavioral, Lifestyle, and Attitudinal) strategies (appropriate tech, cost, risk, and morbidity)
◇ Research, practice, and productivity priorities focused on causes that evoke basic human health mechanisms

To correct the perverse incentives, each of the five parties must have:

- Lower-cost *and* better-outcome alternatives
- A financial reward for choosing them
- Reliable, *transparent* information to choose by
- Clear words ("disease care reimbursement," not "health insurance"; "health," not "healthcare")
- Powerful, knowledgeable purchasing agents
- Rewarding what we want, not the opposite (like paying hospitals for more interventions/errors)
- Rewarding health outcomes, not care volumes
- Holding abusers rapidly and publicly accountable
- Fast learning (biomedical info doubles each <4 y, so the knowledge-*vs.*-practice gap widens daily)
- Clear incentives to deliver *the best health at the least cost.* So…what's the health metric?

What is health?

- Paraphrasing WHO (from Halbert Dunn MD PhD, 1954): "The highest attainable mental, physical, and spiritual development for each individual"
- Russell Jaffe MD PhD: "Youthful longevity"
- My health goal: "Die young and happy, as late and as well as possible without unreasonable burden"
- "Peace is not the absence of war; it is the presence of justice." (—Dr. Martin Luther King Jr.): likewise, health is not the absence of disease; it is the presence of vitality and resilience
- Biological and integrative medicine recognize that perhaps 80% of what brings people to physicians is related to stress, diet, relationship, and environment—not to disease, where they're far more comfortable & focused

How can we measure what we want? The equation of health (Jaffe *et al.*, *id.*)

- Health is the sum of life-enhancing and -enriching choices less life-diminishing and -dissipating choices
- So health is the sum of, and results from, our choices with regard to nutritional, behavioral, and attitudinal competencies, *minus* genetic, acquired toxic, and distress burdens
- Formally, health can be expressed as:

  Σ [nutritional + behavioral + attitudinal competencies] – [genetic disadvantages + xenotoxic exposures + distress burdens]

  or as, say, Σ [100 + 100 + 100] – [0 + 0 + 0] for an idealized "perfect score" of 300

An illustrative application (*id.*)

- Bill C. complains to his doctor of persistent, intermittent fatigue and constant sinus problems, with resulting coughing, hoarseness, and dry, itchy skin; frequent mood changes; and susceptibility to "any bug going around"
- His conventional physician runs standard blood tests, checks for diseases, and excludes anything diagnosable, so Bill's symptoms are treated with OTC cold remedies and cortisone cream, and he is considered "unremarkable"
- Probably his symptoms will temporarily abate, but he won't get better, and his risk of chronic, progressive, degenerative autoimmune illness will remain high

If Bill instead sees an integrative physician practicing consumer-driven health care…

- After in-depth discussion of Bill's personal and family health histories, his diet, stress levels, work and life habits, exercise habits, etc, his physician recommends *functional* tests:
- CRP (C-reactive protein): Inflammation or cumulative repair deficit,
  Homocysteine: Methylation, detoxification competence,
  Oxidized fats: Free-radical levels, antioxidant sufficiency,
  Phagocytic index: First line dendritic cell competence,
  Cellular metabolic acidosis,
  Bowel transit time: Digestion assessment,
  Finger & core temp. on rising: Thyroid function, stress adaptation
  Blood pressure, height, weight
- His physician meanwhile initially recommends a largely whole-foods, alkaline-forming diet, targeted supplementation, regular exercise, better sleep, substitution for any immunotoxins found, and distress reduction techniques, all tracked daily on digital medical diary/record

Bill's equation of health differs under these treatments

- Remember: Health = Σ [nutritional + behavioral + attitudinal competencies] – [genetic burdens + xenotoxin exposures + distress factors]
- So on presenting, Bill had (with illustrative #s):

  Health = [65 + 45 + 40] – [10 + 60 + 65] = 150 – 135 = **15**
- After initial assessment and following initial recommendations, Bill has improved his health:

  Health = [80 + 65 + 70] – [10 + 20 + 25] = 210 – 55 = **155**

  correlating with his subjective experience, and as he progresses further, he sets a higher goal:

  Health = [85 + 90 + 90] – [10 + 10 + 5] = 265 – 25 = **240**

  out of a possible 300 for perfect potential health fully achieved; on this transparently trackable course, he could become "younger than his age" and *healthy* (not just asymptomatic)

What should we have learned by now about sound energy policy?

- More than a Chinese restaurant menu
- Political "balance" between factions is recipe for elephant-and-rabbit stew
- Should not anoint winners or stifle innovation
- Should not force purchase of vast supplies regardless, in case efficiency "doesn't work"
  - Stints both (since both compete for the same resources), so risks getting neither; or, as in early 1980s, risks *getting* both, again bankrupting suppliers, who *need* high demand
- Most energy policy disasters caused by bad public policy, not by uncontrollable events
- How about free-market principles for a change? (let everything compete under clear, fair rules)

What might this suggest for health, once we stop doing harm?

- Switch priority and language (~99% disease care) to *health*
- *Healthy food*—stop treating soil like dirt; encourage CSA (Albert Schweitzer MD: "Wir leben vom Leben das gerade noch gelebt hat"); outlaw food monopsony, prophylactic vet antibiotics, unlabeled GMOs, untested additives, unsafe biocides, food irradiation*,…

  *R. Jaffe MD PhD: "Eat foods that mold, spoil and rot but before they do; if it can't spoil, it's not food" And more good food advice from L. Lands PhD: "Don't put anything in your shopping basket that wouldn't have been commonly available 10,000 years ago"
- Rapidly adopt modern medical IT tools, under strong privacy
- Foster complete quality, outcome, and cost transparency
- Favor highest-value, lowest-risk, health-promoting therapies
- Use universal-coverage or single-payer structure to overcome the first-mover disadvantage and provide equitable health
- Fundamentally reform medical education & innovation; reallo-cate people (Nat'l. Health Corps?), emphasizing communities
- Fund from >2× savings on disease care: >$1T in next decade
- Explore possible analogies to utility decoupling/shared savings…

Rewarding what we want

- Electric utilities, mandated to meet demand, can save electricity ~8× cheaper than making more—but how we form retail prices rewards more sales
- Solution: *decouple* profits from sales volumes, then *share savings* achieved for the customers: thus reward utilities *for cutting your bill, not selling you more energy*, aligning interests & cutting cost/risk
- All regulators endorsed ’88; EEI and AGA now support; for electricity (at early 10/07), 5 states adopted, 6 pending; for gas, 13 adopted, 11 pending
- Hospitals could free bed-days cheaper than making more; in a sense, insurers regulate their prices; is there a worthwhile analogy here?

Another energy analogy suggests potential for remission

- Customers often can and do reject costly, nasty energy choices and *solve their own* energy problems via end-use efficiency, often plus (synergistically) distributed supply
- Many small actions by millions of individuals, communities, and firms are faster than building a few giant plants
  - 78% of the 1996–2005 rise in U.S. energy services was fueled and powered by reduced energy intensity, not increased physical supply
  - Invisible revolution: negawatts + micropower now provide over half of the world's new electrical services, central stations less than half
  - Missing story: in 2006, nuclear power added less gross capacity than photovoltaics added, or 1/10th as much as windpower added; net nuclear power fell 0.5 GW while micropower (cogeneration + distributed renewables) added ~ 30 GW and surpassed nuclear's output; distributed renewables got $56b of private risk capital, nuclear zero as usual; China's installed distributed renewables, 49 GW, reached 7× China's nuclear capacity and grew 7× faster
- As in U.S. mid-1980s energy glut, or recent $100b plant writeoffs, such customer-led investments can strand big, slow supply-side investments and bankrupt their suppliers

Might Consumer-Driven Health surge to offer such potential?

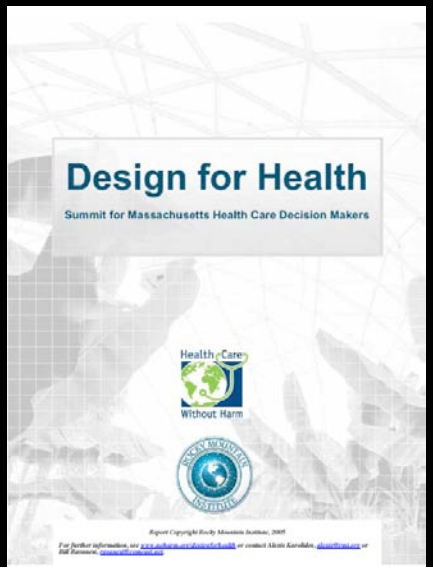
- $1 spent to restore, enhance, & sustain health often returns ≥$3 by year 3—similar to the juicy economic returns of energy end-use efficiency
- Dr. Jaffe plausibly claims that customers can often build their own health *more cheaply* than their current copays and deductibles for disease care—faster, with superior results and rigorously assessible satisfaction
- So can citizens, *if given better education and opportunity,* switch massively to these direct-pay, self-help or alternative routes to health—as trends in organic food, supplementation, exercise, bottled water, etc. now hint?
- Could such shifts trap those who overinvested to treat dwindling diseases, creating a utility-like "death spiral" of rising fees and falling demand, while cheap, fast, direct-pay health investments take over much of the market?
- Could we help make this a self-fulfilling prophecy?

Rethinking places of healing

"[Hospitals have] nothing to do with health. There are no facilities in hospitals for health or for any of the things commonly recognized as contributing to health. The food is as bad as you'd find in the worst fast-food drive-in. There are no facilities for exercise. All the personal factors that can make you well or keep you healthy are removed—family, friends, and sense of *self*."

— Mendelsohn, *Confessions of a Medical Heretic* (1979), p. 80

Design for Health, RMI/Health Care Without Harm, 2005, RMI Publ. #D05-11, www.rmi.org



What do we know so far about green hospitals?

- A few examples, all new, all encouraging
- Strong evidence that green buildings of *other* types improve well-human performance
- Highly suggestive evidence that green health-care buildings improve clinical outcomes
- Strong evidence that green buildings of other types, including labs, have little or no extra cost and have excellent lifecycle economics
- Clearly transferable designs and technologies
- Therefore an ample inductive case to lead in trying green hospitals: manage risks, learn quickly, and spread the learning effectively

Important 2004 compendium

- **The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity**

  by Roger Ulrich and Craig Zimring, September 2004, funded by the Robert Wood Johnson Foundation

"Research teams from Texas A&M University and Georgia Tech combed through several thousand scientific articles and identified more than 600 studies—most in top peer-reviewed journals—that establish how hospital design can impact clinical outcomes."

Ulrich & Zimring *et al.*'s *1200*-study update due Feb 08, + 4 Center for Health Design white papers

Hospital acoustics

- Most hospitals are excessively noisy due to hard surfaces and gratuitous noise sources (paging systems, alarms, bedrail raise/lower, phones, staff voices, ice machines, trolleys, roommates)
- Noise stresses both neonates and adults—higher BP and heart rate, lower neonatal O_2 sat—and, critically, spoils sleep, causing e.g. more rehospitalization in cardiac patients
- Single rooms increase patients' acoustic satisfaction by 11% (2.1 million patients in 1,462 facilities during 2003)—huge
- High-performance acoustic ceiling tile, quieting sources (e.g. noiseless pagers),… work well—better than behavioral change
- Over months, the same group of coronary care nurses, when given quieter surroundings, experienced lower perceived work demands, increased workplace social support, improved quality of patient care, and better speech intelligibility

Hospital daylighting

- Sunlight influences mood, sleep-wake patterns, and length of hospital stay. E.g., bipolar patients randomly assigned to morning-bright eastern rooms had a mean 3.67-d shorter stay than those in west-facing rooms
- Morning light is twice as effective as evening light in reducing Seasonal Affective Disorder (photobiologically linked winter depression) and can reduce agitation from senile dementia
- Elective spinal surgical patients exposed to stronger sunlight experienced less perceived stress and pain, took 22% less opioid analgesia per hour, and had 20% lower analgesic costs
- There's evidence that brighter light can reduce medication errors (**caution**—this may be artifactual: better lighting *quality* is often more important, while more light delivered with poor quality can *reduce* visibility)

Bronson Methodist Hospital, Kalamazoo MI
New facilities (2000)

- Artwork enlivens and "humanizes" nursing station
- Productivity gains: nursing turnover now below 12%
- Patient Recovery and Satisfaction: nosocomial infection rates down 10–11%; overall patient satisfaction rose to 95.4%
- Operations: 6% market share increase, occupancy rate has been 80–85% since opening

Sources: Center for Health Design, "Design Matters in Health-care Facilities"

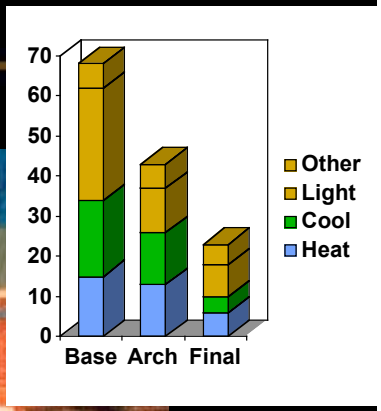
St. Alphonsus Regional Medical Center Boise ID

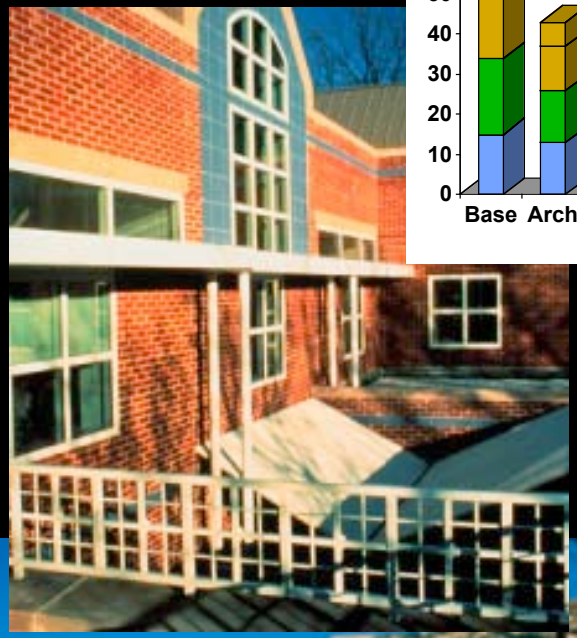
- Renovated a nursing unit in 2003 to test the evidence-based research methodology they plan to use on a larger $161-million addition to be completed in 2008
- Noise levels were reduced by designing larger private rooms, adding carpet to hallways, putting acoustical tiles on walls and ceilings, and relocating machinery and nurse charting away from patients
- Average noise in patient rooms <51.7 dB
- Quality of sleep improved from 4.9 to 7.3 (on a scale of 0–10)
- Patient satisfaction scores improved during a three-month comparison period

Sources: "Saint Alphonsus RMC Unveils Design Plans for its New Center for Advanced Healing," Center for Health Design

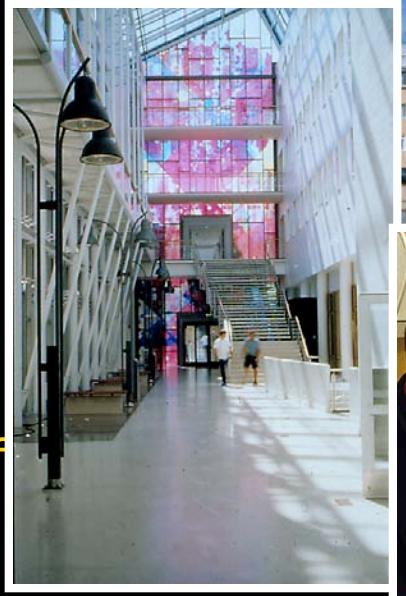
Way Station (Frederick MD): Design Integration for Mental Health Facility

- All-daylit, residential materials palette, easy wayfinding, clear viewlines
- $5.5 million; 2/3 energy saving added $170k and saved $38k/y (more now)
- 4.5-y payback, 22% ROI
- Better healing—"no dark places"





Rikshospitalet University Hospital
Oslo, Norway

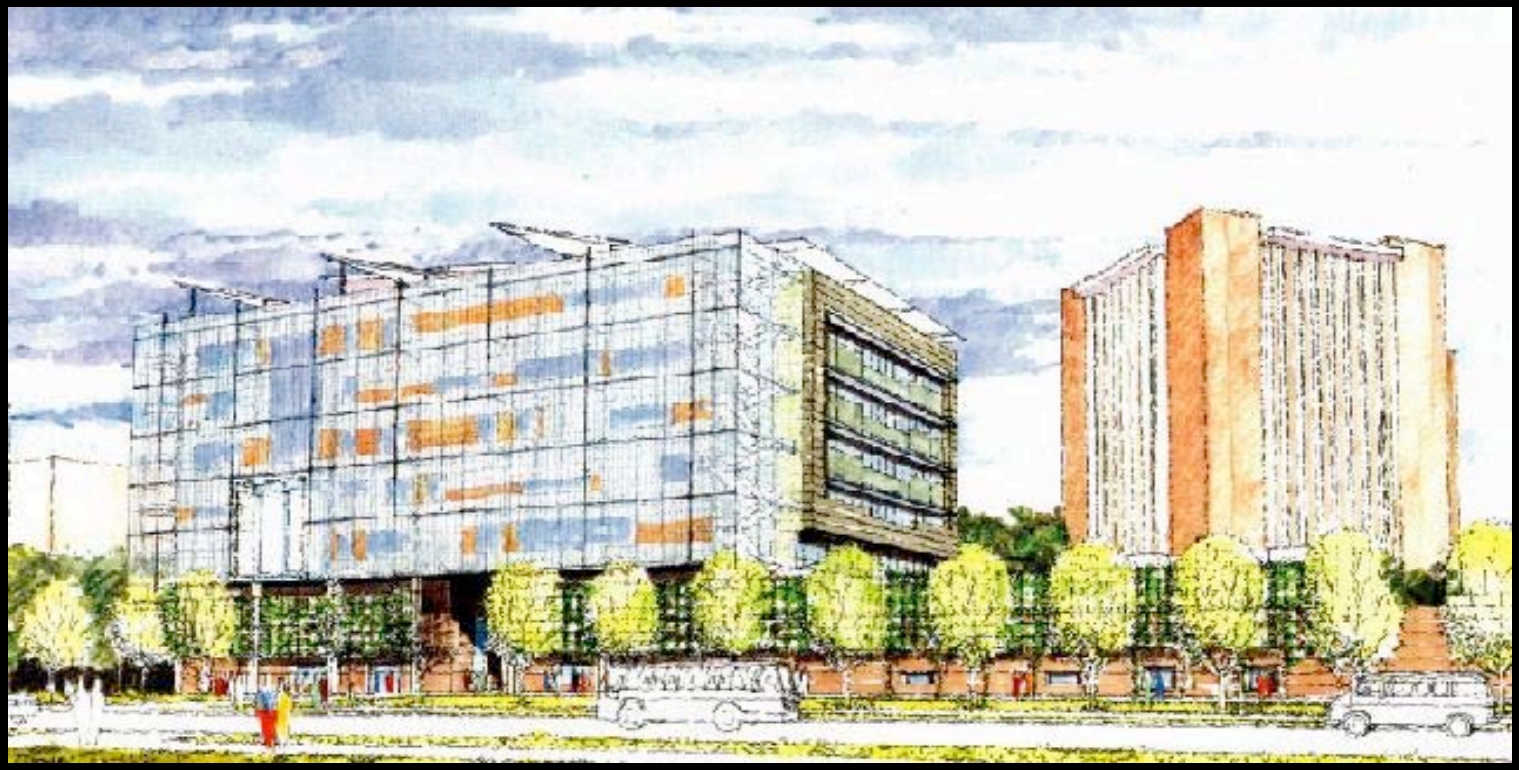


- Ranked 3rd in world for kidney transplants
- Fountains, sculptures, and textile hangings aid wayfinding
- Piano on main street for patients' and visitors' use
- Staff members travel long distances on scooters
- Windows—even in operating rooms—allow patients views of gardens and staff and family views of fjords
- Has nearly doubled its number of patients (250,000 a year), reduced turnover & absenteeism, and reinvigorated recruitment

Source: Lizette Alvarez, *N.Y. Times*, 7 September 2004, "Where the Healing Touch Starts With the Hospital Design"

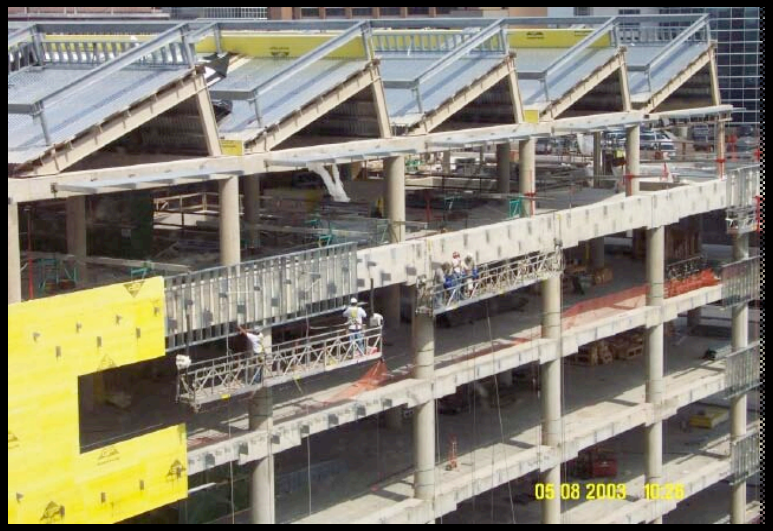
University of Texas Houston

School of Nursing and Student Community Center



To uplift the spirit of dwellers with interior spaces that capitalize on daylighting, radiate simple elegance, reflect timeless design, and are welcoming and comfortable.

University of Texas Houston
School of Nursing and Student Community Center



- blend of passive and mechanical strategies
- long elevations face east and west, but high-performance glazing keeps them cool
- dramatic downsizing of chiller
- underfloor air distribution
- desiccant system removes humidity
- solar cells and fuel cells
- considers health and environmental effects of material choices

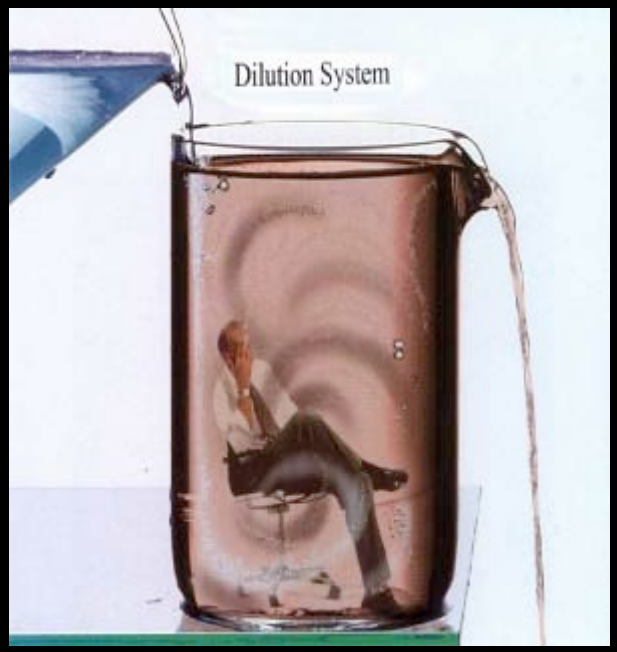
Hospitals: an important opportunity for cleaner air

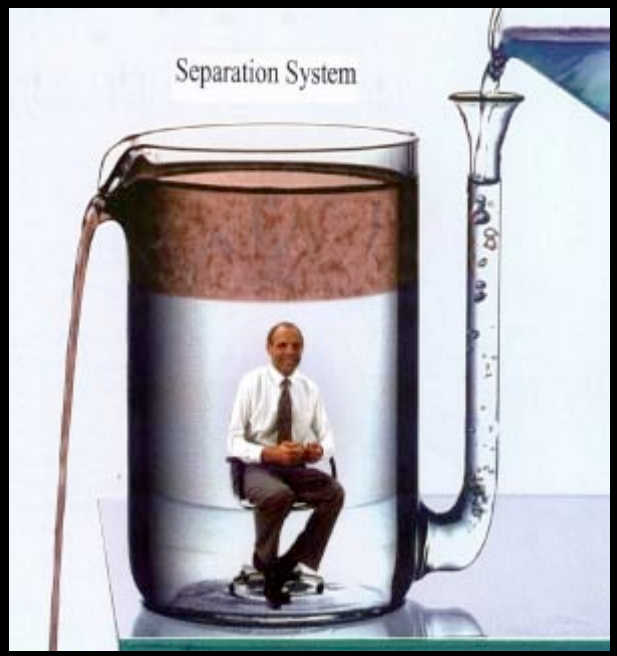
- U.S. spent >$16b building hospitals in 2004, projects >$20b/y by 2010, and they'll remain in service for decades
- The Institute of Medicine (2000, 2001) found that medical errors and nosocomial infections are among the leading causes of death in the United States, each killing more Americans than AIDS, breast cancer, or automobile accidents
- Hospital-based nurses are becoming scarcer and older (RNs average 43 years old, will average 50 by 2010), and have 20%/y average turnover. Low nursing staff levels contributed to 24% of 1,609 patient deaths and injuries studied since '96 studied by JCAHO in 1996
- Three-fourths of Toronto SARS cases were hospital-acquired; as the SE Asian flu factory churns out more pathogens with prospects for pandemic (not to mention rising bioterrorism risk), it becomes ever more vital to design hospitals for enhanced containment, negative pressure options,…

Infection control by airflow design

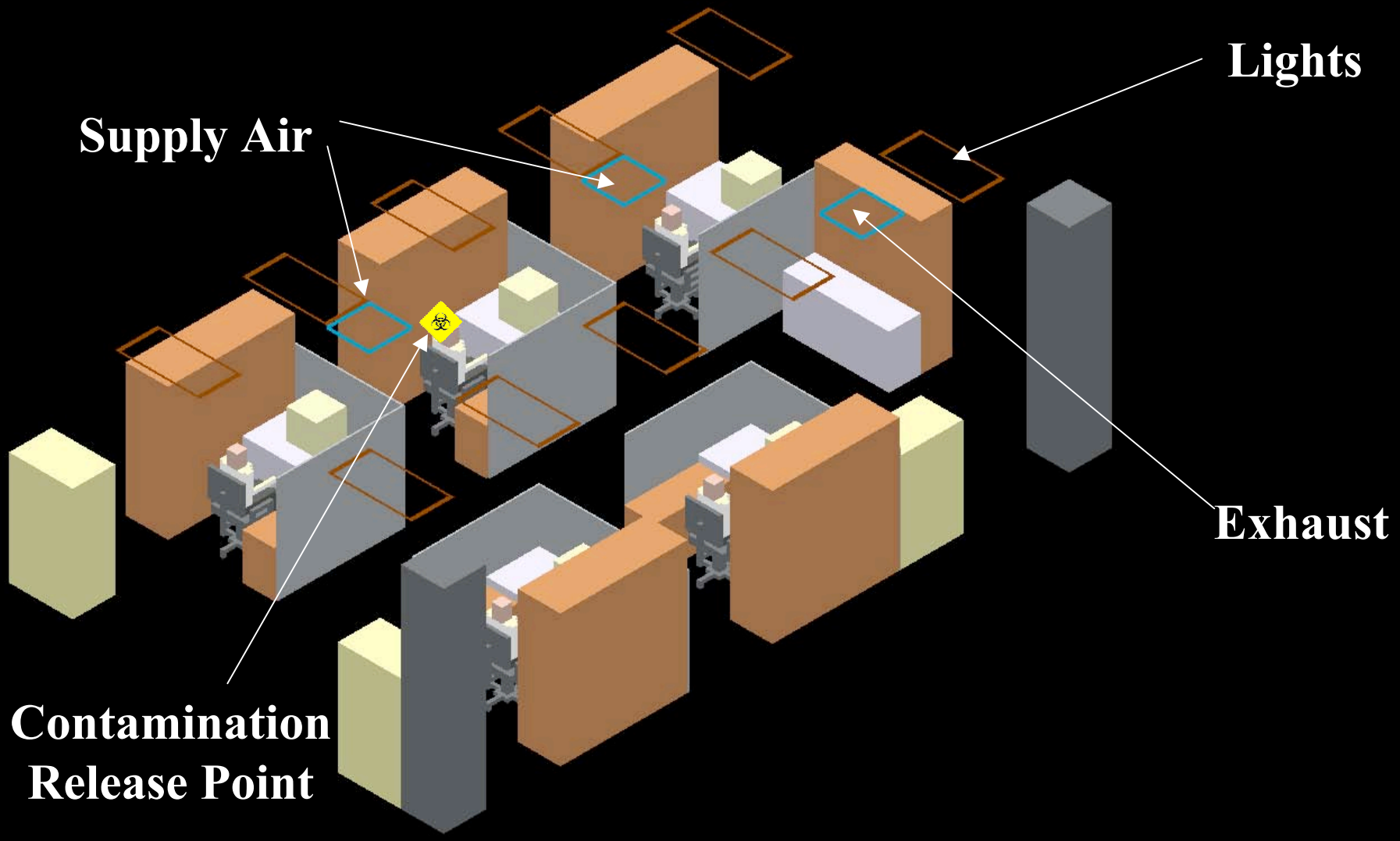
- Hospital-acquired infections decrease with single rooms and very high air quality: design affects both airborne and contact transmission routes
- Immunocompromised patients have fewer infections when in HEPA-filtered isolation rooms (e.g., by 10× for *Aspergillus* in bone-marrow-transplant patients)
- Yet hospital air is often less clean than is normal in industrial cleanrooms—insufficient tech transfer so far
- New cleanroom and lab air-handling designs can probably overcome perceived capital- and energy-cost penalties in applying laminar airflow to medical facility design as CDC and HICPAC recommend
- 100% outside air may (as in the new UC/Davis Medical Center hospital) *reduce* capital cost
- Put UV lamps & carbon filters in AHUs? Be careful about ducts and filters as growth media (fungi,…)

Displacement ventilation improves indoor air quality



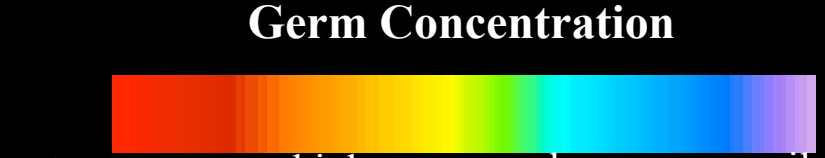


Model of typical office with 5-foot partitions



Conventional mixing ventilation

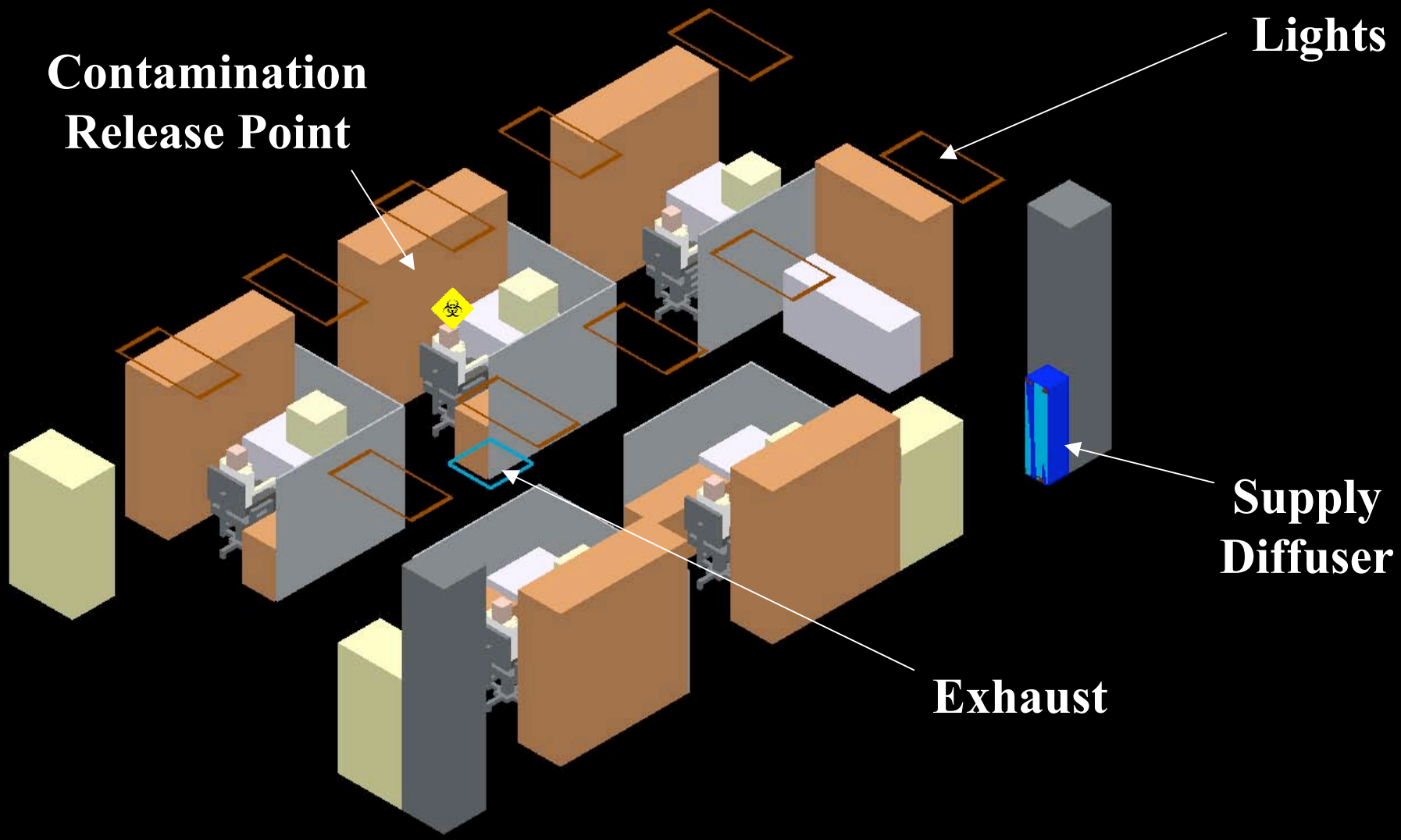
Occupant with cold in
Cubicle sneezes, or
opens contaminated mail



HBI

Animation courtesy of Malcolm Lewis, PE

Same office with thermal displacement ventilation (illustratively using *un*favorable locations)



Thermal displacement mixing

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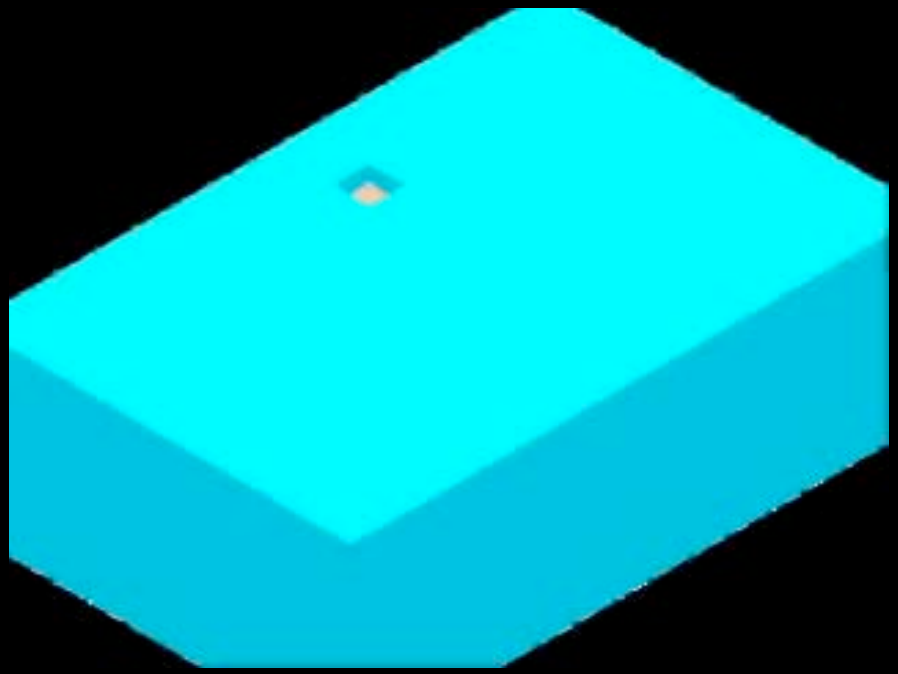
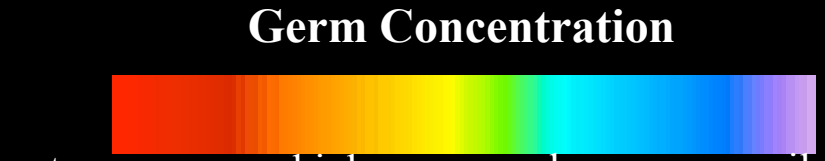




HBI

Animation courtesy of Malcolm Lewis, PE

So why not apply normal industrial logic to infection control?

- What engineers (not surgeons) call laminar airflow is highly developed in high-tech industries' cleanrooms (semiconductors, biotech,…), with airflow up, down, or sideways
- Better design can make laminar airflow even more effective, an order of magnitude less energy-efficient, and much cheaper
- But I'm told this is *not* standard hospital practice in most non-OR, non-ICU patient spaces: they're like standard office spaces
- Displacement ventilation should improve health

Displacement ventilation

- Once thought to increase capital cost (if built like specialized raised-floor computer centers)
- Now known to have comparable or lower total capital cost in offices (so why not hospitals?)
  - Can reduce or eliminate ducts
  - Avoids their pressure drop: smaller fans, smaller chiller to remove fan heat,…; so smaller chillers
  - Less chiller lift because supply air is 65 not 55°F
  - Lower floor-to-floor distance (but higher ceilings)
- Can eliminate air-handling noise
- Needn't drizzle air up through floor—can emit fresh air at baseboard level instead
- Should permit major reductions in air changes/h

And about those air-changes-per-hour (ach) requirements…

- CDC is encouraging them to go ever higher
- Consulting engineers don't seem to mind (they're paid based on *cost* of what they spec)
- But the air isn't sure to *change* (more ≠ better), and ach can't possibly be the right metric
- Meanwhile, the opposite in other industries
  - Severalfold *lower* ach in some chem labs, *better* safety
  - Manyfold *lower* ach in cleanrooms, *better* chip quality
  - All through better aerodynamic design (and some controls)
  - What's different about infection control in a hospital?
- Time to refine CDC's causal logic…before new hospitals' program can't fit in their footprint or budget (as is already starting to happen)

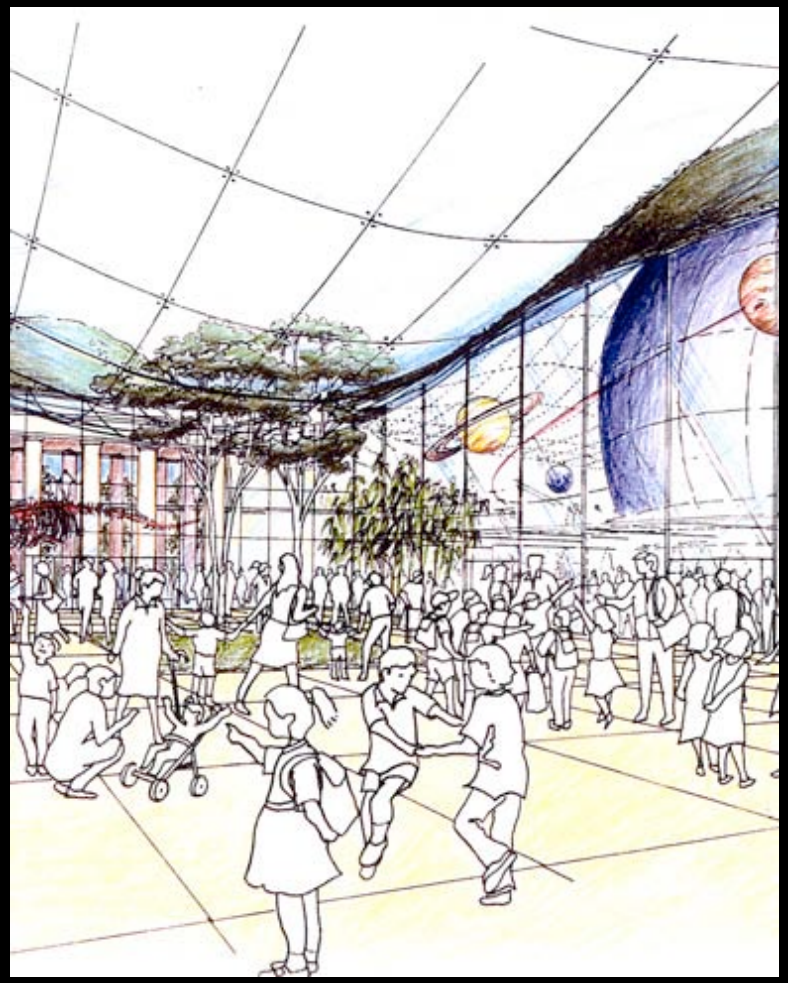
Drivers of Building Green

Materials: The building industry uses 3 billion tons of raw materials—**40%** of total global use

Energy: 40% of the world's energy is dedicated to construction and operation of buildings

Water: The building industry uses **16%** of global fresh water annually

People: The "built environment" is humanity's largest artifact; North Americans spend over **90%** of their time indoors—and buildings shape our health, productivity, & happiness



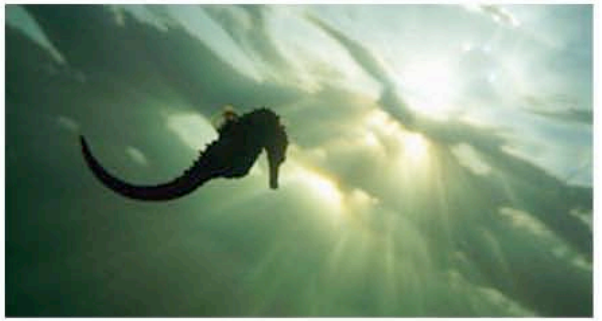
Shouldn't our buildings…

- Make people healthier, happier, and higher-performing?
- Create delight when entered, well-being when occupied, regret when departed?
- Take nothing, waste nothing, and do no harm?
- Be net producers of energy, clean water, beauty, perhaps food, and right pedagogy?
- Cost less to build and operate?
- Be more flexible for unknowable future needs?

Zoos and offices, Victorian and now

(concept by Dr. Judith Heerwagen)





Aesthetics of Survival

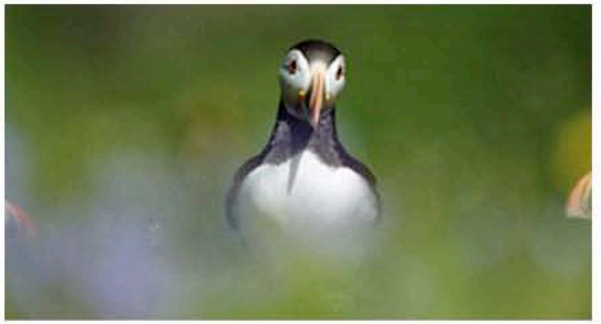
If we can shift the way we conceive the purpose of human artifacts and the process of designing them to one that

- focuses on healing and supporting human and natural communities
- uses nature as a mentor and
- addresses the physiological and psychological needs of the occupants

then we will create an aesthetic that supports human survival.

—Janine Benyus, biologist and author (*Biomimicry)*





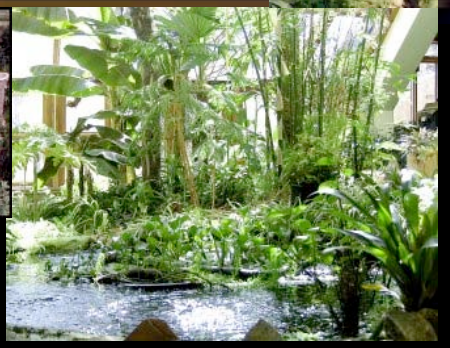
Biophilia

"The biophilia hypothesis boldly asserts the existence of a biologically based, inherent human need to affiliate with life and lifelike processes."

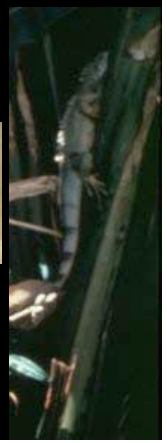
—*The Biophilia Hypothesis*,
Stephen R. Kellert and Edward O. Wilson

A biophilic building maximizes the occupant's connection to the natural environment in order to create a more habitable, productive and healthy indoor environment

Why is my passive-solar banana farm so pleasant to be in?

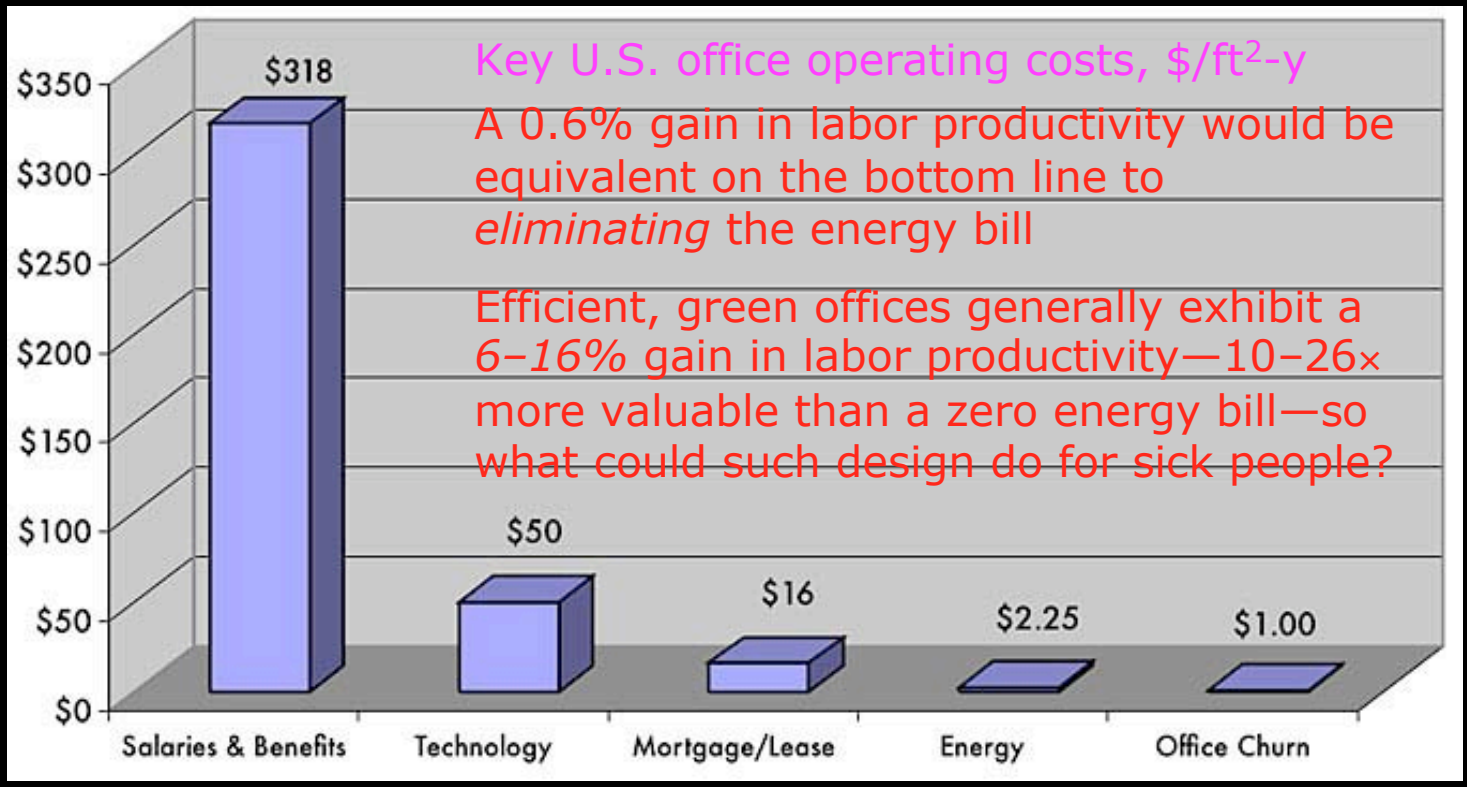


- Natural light
- Curves (do you have corners?)
- α-tuned waterfall, no mechanical noise
- Good indoor air quality (construction + cleaning)
- High radiant / low air temperature, optimal humidity
- Moderately varying (not static) climate conditions
- Sight, smell, O_2, ions, & (optionally) taste of plants
- Ever-changing jungle scenery, interesting wildlife
- ?Very low 60-Hz electromagnetic fields
- Maybe other attributes we don't yet know about



Office productivity gains are ~164× more valuable than energy savings

Occupants' salaries, w/o equipment & benefits, are ~85–92% of the average U.S. cost of office operation. *Salaries, benefits, and equipment total 164× energy costs.* Before Romm & Browning (RMI, 1994), nobody had looked for productivity effects because business schools mistaught the "Hawthorne effect," so MBAs believed such effects were a myth. Now they're turning up everywhere.

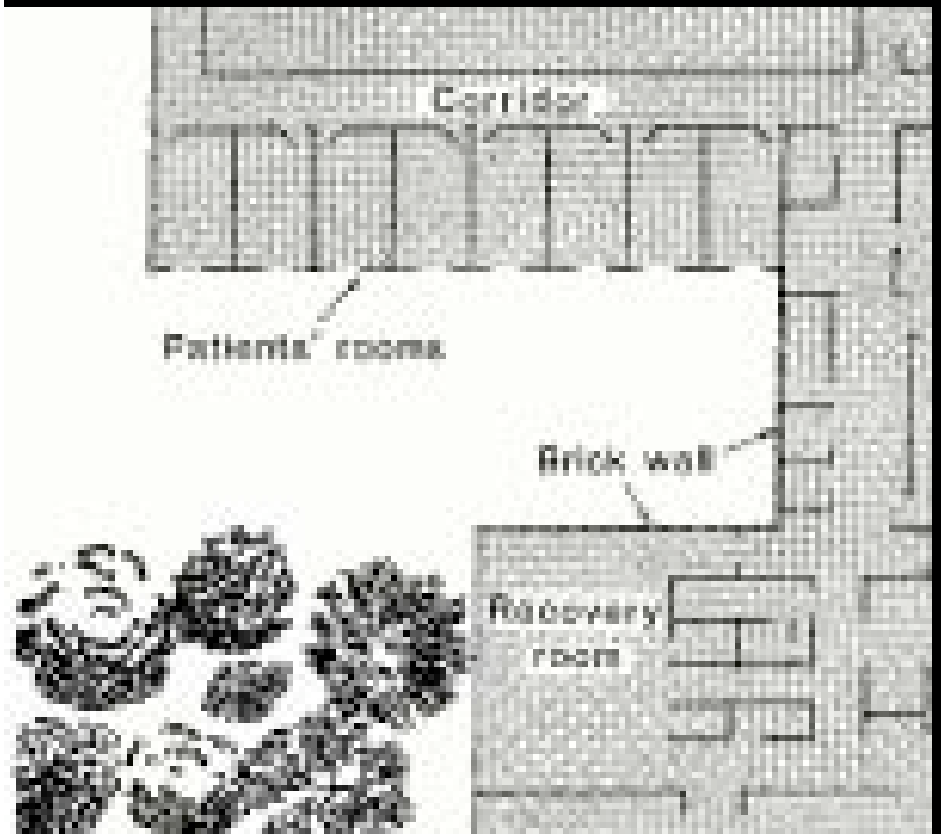


Source: Carnegie Mellon University's Center for Building Performance and Diagnostics 2005 update of RMI's 1991 analysis, using typical U.S. data, posted at www.buildinggreen.com/auth/image.cfm?imageName=images/1310/chart_costs.jpg&fileName=131001a.xml

View Through a Window May Influence Recovery from Surgery

Ulrich 1984

n = 46



- shorter hospital stays
- fewer negative comments
- fewer strong analgesics

Views of nature reduce ICU nurses' stress

Nurses who took their noon break in a lounge with windows overlooking mature trees had significantly reduced stress levels and made 40% fewer errors on a task than nurses who took their break in a windowless lounge

—Ovitt 1996

Patient recovery and nature images

At Uppsala University Hospital in Sweden, of 166 patients who had undergone open-heart surgery, those exposed to a picture of an open view of water experienced much less postoperative anxiety than those exposed to no picture or to other types of pictures (rectilinear abstract art *increased* anxiety levels)

—Ulrich & Lundén 1990

Nature and Health: The Relation Between Health And Green Space in People's Living Environment

— Vries *et al.* 2001

n = 11,296

"The results showed that the amount of green space in the living environment was indeed positively related to the experienced health condition."

What are we waiting for?
We are the people we have been waiting for!

All we are saying
is give *health* a chance.

—Russell Jaffe MD PhD

"Only puny secrets need protection.
Big discoveries are protected
by public incredulity."

—Marshall McLuhan

0945, Miami Room: "Advanced Design Integration for Radically Energy-Efficient Buildings [~80–90% savings] at Lower Capital Cost [by ~3–5%]"

www.rmi.org
www.rmi.org/stanford
www.natcap.org
www.oilendgame.com