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comment	Ira Katznelson	Evil & politics 7
on inequality	James K. Galbraith	A perfect crime: global inequality 11
	Orlando Patterson	Beyond compassion 26
	Richard A. Epstein	Against redress 39
	Christopher Jencks	Does inequality matter? 49
	Sean Wilentz	America's lost egalitarian tradition 66
	James F. Crow	Unequal by nature: a geneticist's perspective 81
	Ernst Mayr	The biology of race 89
	Martha C. Nussbaum	Sex, laws & inequality: India's experience 95
	Robert W. Fogel & Chulhee Lee	Who gets health care 107
Ian Shapiro	Why the poor don't soak the rich 118	
poetry	Frank Bidart	Young Marx 129
fiction	Bharati Mukherjee	A wedding 131
notes	Howard Gardner	on intelligence 139
	Frank Wilczek	on the world's numerical recipe 142
	David G. Nathan	on clinical research & the future of medicine 147
	Neil J. Smelser	on a new encyclopedia 151
	Gerald Early	on Miles Davis & Vince Lombardi 154



Comment by Ira Katznelson

Evil & politics

In the immediate aftermath of the events of September 11, 2001, it was hard to know what to say. We seemed bereft of “a terminology,” as Madame de Staël observed after the Jacobin Terror, in a situation “beyond the common measure.” In the days that followed, my own thoughts turned to Hannah Arendt, and the works she had written in an effort to grapple with another situation beyond the common measure. “The problem of evil,” Arendt forecast in 1945, “will be the fundamental question of postwar intellectual life in Europe – as death became the fundamental problem after the last war.”

‘Evil’ is a word one heard with some frequency in the aftermath of the attacks on the World Trade Center and the Pentagon, though rarely deployed with Arendt’s precision. Within some intellectual circles, a denunciation of these acts as evil has been accompanied by a far too simple justification of liberalism and the Enlightenment as decency incarnate. Evil, in this view, implies more than doing harm or inflicting pain on

innocents. Behavior is evil when it attacks valued goods proffered by Western modernity.

Disputing the integrity and worth of these goods, critics in other intellectual circles have focused instead on the evils of postcolonialism and the exploitative relationships characteristic of global capitalism. It is these iniquities that should command our attention, not the acts of terror they consider in a cooler, sometimes icy, register.

I find the impulses at play in both responses unsettling. Each group is better at assuming a posture than developing ways of acting and living decently in a world riven by heterogeneous, interconnected, and sometimes conflicting cultures. A rote defense of Western liberalism could very well authorize a new brand of colonialism, once again making many non-Western peoples ineligible for its core values of rights, toleration, participation, and consent. A wholesale rejection of enlightened liberalism as a mere figment of Western imperialism could very well license an irresponsible and foundationless antimodernism, reinforcing a mirror-image view of ‘us’ against ‘them.’ Intransigently advanced, each perspective evades asking how we can shade the sensibilities, deepen the capacities, and address the limitations of the liberal tradition in full awareness that credulous notions of human perfectibility have been mocked by the global diffusion of human superfluosity, the central hallmark of modern

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“radical evil,” as Hannah Arendt argued in *The Origins of Totalitarianism*.

Writing in the aftermath of total war and the *Shoah*, Arendt sought both to apprehend the appearance of “radical evil, previously unknown to us,” and to transform the eschatology of evil into a systematic tool with which to name and explain the terrible cost Nazism and Stalinism had exacted. By ‘radical evil,’ she understood the project of erasing the moral and the juridical person as a prelude to physical annihilation. Justified by millenarian ideologies and advanced by what Arendt called manufactured unrealities, radical evil literally erased human plurality by stripping large populations of their rights as citizens, including the right to a name, as a prelude to mass killing. Turning innocents into nonpeople, both the Nazis and the Soviets thus elided the liberal tradition’s central puzzle of how to make it possible for incommensurable values and identities to coexist, perhaps even flourish, in a climate of toleration.

Although today’s constellation of Muslim fervency, fascist-style mobilization, and Internet-friendly coordination may be new in some respects, it is manifestly as capable of producing radical evil as the barbarous offshoots of Western civilization Arendt addressed, even if thankfully it has yet to equal them. Familiar, too, are the challenges that Islamic zealotry can pose to the tradition of Enlightenment and to the possibilities of a decent liberal politics.

Given these hazards, we need to explore whether the Western liberal tradition can effectively contest radical evil without sacrificing its own best features. I think it can, though not on its own and only if liberals can find a terminology and institutional practices to engage with nonliberal beliefs and cultures without dismissing them too hastily as irretrievably antiliberal.

Any meaningful effort to refine the language and institutions that a robust liberalism requires must move beyond a thin and often misleading claim to universality; it also can gain confidence from a fresh appreciation for the Enlightenment’s rich, though often neglected, lineage of realism and a recognition of liberalism’s history of invention and transformation. Kant, for example, worried about the demagogic uses of reason and the possibility that a new set of ostensibly enlightened “prejudices [can] serve, like the old, as the leading strings of the thoughtless masses.” He also well knew that demonic violence has long characterized human affairs. Such realism is quite distinct from the rosy optimism of those eighteenth-century *philosophes* who supposed that systematic understanding would trump torture and barbarism, as if to realize the title of Pierre-Paul Prud’hon’s painting of 1798: *Darkness Dissipates as Wisdom and Truth Descend to Earth*. Rather than Prud’hon’s canvas, it is Goya’s etchings of *Los desastres de la guerra* after the Spanish insurrection of 1808 and the Peninsular War with Napoleon that might better be adopted as chastening emblems of a humane realism.

Today’s terror forces, or should force, an engagement not just with this year’s instance of evil but with a proper role for realistic reason and institutional innovation in the face of a persistent human capacity for desolation, now enhanced by the legacy and diffusion of twentieth-century models of radical evil. Times of turmoil and fear urgently pose two questions: whether liberalism can thrive in the face of determined adversaries and what kind of liberalism we should wish to have. Answers to ‘what kind’ affect the possibilities for ‘whether’ by offering choices not only about doctrines but also about institutions and public policies.

The ideals of the liberal tradition,

properly appreciated, represent an open sensibility rather than a fixed set of arrangements or ideas. The most important moments of innovation and change in the modern West's liberal political tradition have come in circumstances governed by anxiety and alarm. Consider not only Locke's institutional formula for toleration in conditions of religious warfare between Catholics and Protestants, but his specifications for political consent and representation in the context of a century of civil war in England. Consider, too, the constitutional innovations of Benjamin Constant in France when faced with a global war and the collapse of legitimate kingship. Consider, finally, the development of the twentieth-century liberal welfare state in response to depression, class conflict, and the rise of Bolshevism, Fascism, and Nazism.

Especially at moments of danger and innovation, the liberal tradition has been neither self-contained nor homogeneous. There have been liberal democrats, liberal socialists, liberal republicans, liberal monarchists – and also liberal Christians, liberal Jews, liberal Muslims. In each instance, the absence of a partnership with political liberalism has proved an invitation to oppression. Without a commitment to such a cardinal liberal value as toleration, even a declared democrat may be tempted by despotism. The liberal tradition is thus necessary to an effectively decent politics. But it is not sufficient. An abstract commitment to universal human rights by itself, without depth, passion, and historical particularity, cannot possibly contend with radical evil. An effective liberalism modifies but does not replace other commitments.

The more global our world, as Dipesh Chakrabarty reminds us, the more imperative it is to register that the prove-

nance of an idea may affect its status but not its value or capacity. Even if liberal political thought is inescapably Western in origin, it no longer belongs only to the West. "Concepts such as citizenship, the state, civil society, public sphere, human rights, equality before the law, the individual, distinctions between public and private, the idea of the subject, democracy, popular sovereignty, social justice, scientific rationality, and so on," he observes, "all bear the burden of European thought and history." These secular and universal categories and concepts were preached "at the colonized and at the same time denied . . . in practice. But the vision," writes Chakrabarty, "has been powerful in its effects. It has historically provided a strong foundation on which to erect – both in Europe and outside – critiques of socially unjust practices. . . . This heritage is now global." Even when contradicted by such deep injustices as slavery and Jim Crow, European imperialism, and today's spectacular global inequalities, struggles based on these orientations ensue "because there is no easy way of dispensing with these universals in the condition of political modernity." Or at least, one might say, no attractive struggles are possible wholly outside their frame.

Both liberalism and the Enlightenment within which it nestles advance a philosophical anthropology of rational actors and rational action, insisting that human agents develop the capacity to deliberate, choose, and achieve sensible goals. In their effort to cultivate such rational citizens, liberal regimes in the past have all too often imposed various limits, drawing boundaries that stunt the capacities of individuals based on their religion, race, gender, literacy, criminality, or colonized status. But after centuries of struggle about the dimensions of freedom, enlightened political liberalism

*Comment
by Ira
Katznelson*

today acknowledges *no* legitimate barriers to reason, hence no legitimate ascriptive barriers to liberal inclusion and liberal citizenship.

The result is a deep paradox. The global appeal of an enlightened liberalism cannot help but jeopardize the local attachments, the historical particularities – the human plurality – that constitute its most important rationale.

Here, then, lies liberalism's most basic current conundrum: how to broaden its endowments in order to protect and nourish heterogeneity while coping with its perils.

As our version of this challenge beckons, it is not a war on terrorism that will define the early twenty-first century, but a series of battles for the soul – that is, for the content, rules, and respectful inclusiveness – of a properly robust, and realistic, liberalism. This endeavor, rather than a stylized conflict about the merits of Enlightenment, had better be the struggle we make our first priority.

Richard A. Epstein

Against redress

One of the hardy perennials of political theory asks how, if at all, one might justify the inequality of wealth and opportunity that is so manifest in society. The issue has been with us from the earliest times, but it seems to have gained renewed urgency in the past decade or so as economic inequality in the United States, if not in the rest of the world, seems to have become more extreme with the rise of technology.

In his essay “Beyond Compassion,” Orlando Patterson captures something of the current anger over inequality when he laments the perverse distribution of wealth that allows the CEO of a large corporation to pull down wages and stock options that exceed the wages and benefits of a thousand line employ-

ees. He condemns the society that offers nothing but small handouts to mothers who raise small children but awards fortunes to go-go dancers.

It is easy to recite statistics to show that an ever-greater percentage of wealth is concentrated in – take your pick – the top 1, 5, or 10 percent of the income distribution in the United States. Public discomfort with the current situation is only magnified because this economic divide between rich and poor often tracks profound and enduring racial cleavages.

In our multiracial society, it is an oversimplification to treat the inequality of income and wealth as a racial problem. But, that said, there is ample evidence to support the proposition that whites as a group are blessed with both greater wealth and higher income than their black counterparts. In many quarters, the combination of these two dominant features raises twin concerns about political stability and racial and economic justice.

In light of this sorry state of affairs, it is perhaps too easy for Patterson to conclude that the market is a “moral non-starter.” But denunciation is not quite the same as argumentation. The current distribution of wealth in America is not just the product of the market. It is also

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the product of the crazy-quilt pattern of regulation and taxation that seeps into every area of life. It is therefore necessary to disentangle the consequences that flow from regulation from those that flow from the market, which in return requires some theory of what a society based on the market looks like.

Frederich von Hayek's claim that local knowledge in a decentralized system will outperform the handiwork of state ministers (many of whom control literally tens of thousands of times the wealth of ordinary peasants) remains unrefuted by history, so much so that virtually all systems of regulation, wise or foolish, treat the market almost by default as the starting place for analysis. Labor statutes do not prohibit negotiations between management and labor to set wages and working conditions. They just institute a system of collective bargaining. Antidiscrimination laws do not shut down private employment markets. They only specify certain grounds on which employers are not allowed to base their hiring decisions. One can attack or defend these institutions for the consequences that follow in their wake, but the simple and inescapable truth today is that when it comes to the provision of goods and services, nothing beats the market.

Like it or not – and “moral” or not – with the demise of central planning, the market *is* our starting point.

It hardly follows, however, that the market is both the starting *and* the ending point of the analysis. Questions of both social and economic inequality remain with us still. Today's sorry state of affairs, which finds prosperity tempered with poverty, surely invites some wholesale reform. Obviously, as a political matter, it is hazardous to argue that, even if we keep our market institutions, the redress of inequalities within the

United States does not, and should not, rank high on the list of legislative priorities for the social and economic reforms of the next generation.

It is nevertheless this hazardous position that I wish to defend.

In order to show why the redress of inequalities should not rank on our list of legislative priorities, I shall first try to outline a sensible theory that helps explain both the uses and the limitations of the market. The theory here is rightly described as libertarian in its orientation, but it makes no pretense that the market can discharge all social functions or indeed operate on its own resources without the assistance of the state. Rather, it argues that state intervention is needed to supply all individuals with protection against force, fraud, and monopoly.

Once this benchmark is established, I shall then sketch out in general terms two separate lines of argument used to justify government intervention to redress economic and social inequality, and then indicate why both of these fall short of their intended goal. These are arguments about restitution and redistribution, respectively.

Finally, I shall indicate briefly a general strategy for social reform that could, and should, be adopted to achieve a more just society, without the costly and unneeded by-products of government intervention. Rather than add more layers of taxation and regulation, the best tonic for a healthy society is to free up entry into a host of markets by removing the plethora of taxes and regulations already in place. The emphasis should be on self-sufficiency, not transfer; it should be on making the economic pie greater, not trying fitfully to use government action to put more goods in the hands of those who need them the most.

The question of economic and racial inequalities plays itself out on a vast canvas. But as with so many large problems, it is best attacked by breaking it down into smaller problems that may prove amenable to legal solutions that satisfy our best moral and political instincts. Before attempting to understand the role of state power in dealing with claims between groups, it is far easier to ask when the state should back a claim for compensation or support brought by one individual against another.

The first place to turn is the theory of corrective justice that has dominated our view of human interactions since Aristotle. It takes little imagination to award compensation to the person who is either physically attacked or duped by another.

As an initial matter, it is hard to deny the proposition that the (indiscriminate) use of force or fraud seriously diminishes the overall welfare of society. The individual who takes from another always gains, but that gain pales into insignificance beside the loss inflicted on the other person. This reduction in overall wealth and utility (for in this context the two go hand-in-hand) moreover has adverse consequences on third parties, who perceive themselves as at risk when force and fraud are allowed unabated.

At the same time, Aristotelian, Kantian, and utilitarian moral theories are all hard-pressed to condemn any form of vigorous economic competition that involves neither force nor fraud. The routine business transactions of everyday life produce a common good – economic gains for all parties to the transactions. That increased wealth in turn creates still greater opportunities to produce more goods for trade through third parties. Insofar as this is true, we do not need to know whether one party

to the transaction is rich and the other poor, because the voluntary transaction will improve the position of both, regardless of their initial endowments of wealth.

This is why a market analysis is, emphatically, a *moral starter* for social theory.

The standard libertarian theory therefore has ample grounds to draw a sharp line between aggression and deceit, which it condemns, and competition, which it praises. Competition expands the size of the pie, and of each of its slices; coercion reduces the size of the overall pie, and forces some individuals to bear a disproportionate share of the loss.

Many Marxist or left-wing theorists dispute this result by insisting that ordinary market transactions are contaminated by exploitation, which is, when all is said and done, a form of theft.

The term “exploitation” requires, of course, some explication. Clearly, no one is particularly upset when it is said that a skillful halfback exploited an opening in the defense in order to run for a touchdown. Taking advantage of opportunities made available within the context of the rules is often a good, not a bad, thing. And the firm that exploits an opening in the market to introduce a new widget that displaces its creakier rival deserves our thanks, not our condemnation.

To the determined Marxist or his modern sympathizers, however, exploitation often carries the more cynical connotation that one side of the transaction is left worse off than he would have been if he had never entered it at all.

But this view of exploitation offers no explanation as to why someone down on his luck would choose to make a contract that left him poorer than before. Many contracts are performed on a

repetitive basis: the ordinary worker can quit at any time and yet frequently will return to work day after day. He obviously does so because he thinks that this opportunity is better than any of his alternatives, and it would be an odd form of assistance to ban him from that line of work altogether.

In some cases, the charges of exploitation are refined so that they concede the point of mutual gain by contract, but insist that the worker is exploited because the firm has obtained a disproportionate share of the joint profit from the transaction. Why they presume the asymmetrical division of this unobserved gain remains something of a mystery. Their intuition is that minimum wage laws, for example, can boost the least fortunate worker's share of the gain to a larger, and more just, proportion.

But the imposition of any such rule of division does more than alter shares enjoyed by current players. It also changes the entire landscape. The higher minimum wage will induce some employers to reduce their workforces, others to change nonwage terms of the contract. It will narrow the gap between lower- and higher-skilled employees and thus reduce worker incentives to invest in their own human capital.

Yet, ironically, the one effect that is not likely is a reduction in the employer's share of the surplus, for the higher the minimum wage, the more likely that some firms will exit from the market.

Hence, the one confident prediction we can make is this: any effort to tilt by legislation the contractual wage balance in competitive markets will block voluntary transactions, leaving both sides worse off than before. The Marxist conception of exploitation is in the end undermined by the unjust consequences that its application in practice will produce.

This does not mean, however, that exploitation is an empty concept. It receives its best definition from classical economic theory, which condemns (as some hard-core libertarians do not) monopoly, even if it grows out of voluntary combination and not government (or private) coercion.

For the purposes of this essay, I shall accept the standard efficiency-based economic theory that in general seeks to regulate or outlaw monopoly for the resource losses that it imposes on society as a whole. Hence it may in principle make sense to regulate the rates charged by natural monopolies (i.e., traditional water, power, and light companies) that cannot be divided without fatal losses in efficiency. And it may in principle be possible to prevent the formation of voluntary cartels that seek to divide markets or to rig prices.

But if this theory allows the use of government force to break up or limit monopoly power, by the same token it takes a very grim view of any state barriers to entry into various economic or social markets. The state that imposes a protective tariff may benefit some local industry, but that interference with trade places a far greater burden on those other individuals who are blocked from choosing their trading partners.

Within this general framework, the state also commits a wrong against its own citizens when it imposes restrictions against their entering into some trade or business, unless that restriction is clearly calibrated, as most occupational restrictions are not, to prevent the practice of fraud on hapless customers.

We are now in a position to outline the relationship between this general theory of individual rights and the larger issues of economic and racial inequality. One way to frame the issue is to ask

whether poor people generally, or black people specifically, have a claim for restitution from society at large.

To state the question in this way requires us to observe at least two important caveats. The first is that we cannot predicate sound theories of restitution on bad theories of social justice. The case here cannot rest therefore on undifferentiated charges of exploitation but must be tied to a demonstration that these individuals have been the group victims of force and fraud, including the imposition of barriers to entry, by other members of society.

The second caveat is that in principle the question of restitution is not restricted solely to the position of African Americans, but could in fact be asked in connection with American Indian tribes, with Chinese and Japanese immigrants, or indeed with any group that claims to have suffered injustice at the hands of others. But for these purposes at least, I shall concentrate on the black experience precisely because the answer to the question of whether restitution should be provided may seem to be self-evidently in the affirmative.

After all, there is little question that the institution of slavery as practiced in the United States before the Civil War and the racial restrictions that lay at the heart of Jim Crow and the black codes were wholly indefensible when measured against a basic theory of libertarian rights. Excluding blacks from participation in the political and social life of that time constitutes one of the great stains on our history, made still worse by the countless acts of private violence and intimidation to which the state turned a blind eye.

Yet it is one thing to recognize the commission of these past serious wrongs, and quite another to conclude that they support claims for restitution

today to the descendants of the victims of state and private violence.

Critical problems arise on both sides of the line. Who should receive restitution? And who should be made to pay for it? Let us take these two elements in order.

First, who counts as a victim? That question was easy to answer in 1865 when huge portions of the African American population in the United States had just been released from the bonds of slavery. But it is far harder to afford victim status, over 135 years later, to their descendants. No one alive today suffered the cruelties of past regimes.

The point here is especially true when claims for restitution are pressed on a limited basis. For over twenty years, for example, black parents in Kansas City, Missouri, have pressed claims for restitution by claiming that black children in the city had been victims of the vestiges of segregation that survived after the 1954 Supreme Court decision in *Brown v. Board of Education*. But no remedy here can fit the ostensible wrong, for today's schoolchildren in the district bear no relationship to the black children in that district whom segregation might have shortchanged two generations ago. Quite simply, the program forces vast amounts of state tax revenue into lavish expenditures in one school district, while the educational needs of other children, black and white alike, suffer from comparative neglect.

The difficulties are, if anything, greater in considering who should pay these claims for restitution. Here the nub of the difficulty is that the state is not just some disembodied entity with a heart and mind of its own. Even more than the private corporation, it is a composite of huge numbers of individuals who bring to this sprawling nation their own distinctive pasts. Any program of

restitution, however, contemplates the use of tax dollars to benefit some subclass of the population at the expense of everyone else. In all cases, this approach necessarily results in risks of overinclusion.

For example, the claim for restitution brought against the German state after World War II necessarily fell with equal weight on resistance fighters and the most ardent Nazis. Even so, the state ran the risk of overinclusion because of the immediacy and enormity of the wrong; it adopted a two-pronged approach that compensated survivors of the Holocaust and their descendants, and then, generally, the state of Israel.

It is hard to see how one could devise any similar program of restitution for the descendants of former slaves in America. Too much time has passed to have any confidence that the brunt of these payments will be borne by individuals who had any connection, direct or indirect, with the wrongs of a previous generation. Many Americans today descend from those individuals who gave their lives during the Civil War to free the slaves. Millions of people have migrated to our shores from just about every point on the globe, often to escape the physical danger and economic oppression of their own lands. By what right do we ask these immigrants and their children to compensate blacks whose ancestors have been injured by others when they have done nothing wrong themselves?

We could, of course, bite the bullet and conclude that some substantial transfer payment should be made from general resources nonetheless. But even here, we have to consider the complications that remain.

Claims for restitution today do not occur in a vacuum. The same country that saw Jim Crow was able to redirect

its moral compass and provide extensive programs that were designed to remedy some of the past conditions of slavery. We have had extensive affirmative-action programs; we have had programs that targeted the educational shortfalls on inner-city youth, predominantly black; we have extensive welfare programs that benefit disproportionate numbers of African Americans.

As a matter of social cohesion, I believe that we would do far better keeping some general programs in place that help those at the bottom than trying to find ways to pay restitution to blacks rich and poor alike. Owing to the complexities involved, my great fear is that any program of restitution will emerge as a twisted jumble of preferences that heaps a second set of injustices on the first.

Having examined the claims for restitution made by African Americans today, I shall next briefly address the question of the best social response to inequalities of wealth.

Much of the wind would be taken from the sails of the current restitution movement if the average income of black citizens were equal to that of whites. But while claims of economic inequality only lurk behind restitution claims, they become the centerpiece of any claim for the redistribution of income and wealth.

This claim of course runs smack into the libertarian prohibitions on the use of force and fraud, for it honors claims for redistribution even when the poor person concedes that he has no corrective justice claim to the wealth of the rich person. The question is whether these inequalities of wealth justify some action for redress when the wealth is acquired, and accumulated, through industry, thrift, and invention.

Perhaps the easiest way to make the case for *some* redistributive action is to appeal to the diminishing marginal utility of wealth. The point here is that the value of the additional dollar drops the more dollars that a given person has. A perfect system of wealth transfer between persons could presumably improve aggregate social utility by taking dollars from the persons who need them the least, giving them to the persons who need them most. The total number of dollars could, in some ideal world, remain constant after the transfer. Does greater satisfaction from these (redistributed) dollars justify the coercive transfer?

One conceptual obstacle to this argument is that it is fanciful at best and mischievous at worst to purport to make these interpersonal comparisons of wealth. Clearly no social ruler (pun intended) lets us know with certainty that wealth is worth more in the hands of a poor person than in the hands of a rich person, so the determined economist can shipwreck the case for wealth transfers from the start by denying the possibilities of interpersonal comparisons of utility. I can assert that wealth is worth more to the poor person than to the rich person; you can deny that proposition. The rich person might use the next dollar to complete work on an invention that will improve the lives of others. The poor person might squander it on a drinking binge. We have no way of knowing if wealth is more useful to a poor than a rich person.

Still, this hard-edged argument has bite only insofar as it cautions us against the easy assumption that the marginal dollar is *always* worth more in the hands of the poor person than in the hands of the rich person. But it does not in my view show that *in general* these comparisons are ill conceived. Homeless people

on the edge of starvation *do* on average need that next dollar more than the fashionable elites choosing between vintage wines. The entire enterprise of charitable activities, through churches, hospitals, and schools, would be largely unintelligible if in fact the marginal dollar of wealth were, and were perceived to be, worth as much in the hands of the rich as in the hands of the poor. Who would choose to fund soup kitchens, childhood vaccinations, and scholarships under those circumstances?

So one conceptual objection to redistribution fails to deliver a knockout blow. How then does one continue to dislodge demands for state-mandated redistributions of wealth?

A more promising line of argument seeks to demystify the state by treating it merely as the agent for those individuals who in any given situation benefit from its actions. Hence the question of whether the state can take wealth from A and give it to B can be reposed: can B demand some part of A's wealth, solely because B needs it more?

At this point, the hard-core libertarian will dismiss B's claim as mere theft – a coercive seizure of private property. The state, therefore, is no better than the Robin Hood who takes from A and gives to B.

This argument looks too glib to be wholly convincing. There are marked differences between an organized system of state redistribution and the isolated actions of a brigand. State action can proceed through the ordinary channels of taxation and thus does not present the same threat to peace and social order as the actions of the ordinary thief. In addition, the social levies in question are not concentrated against one person on a whim, but are part of a comprehensive social plan that asks *all* of the more fortunate among us to con-

tribute something to the support of those who are least fortunate. This web of institutional constraint surely makes state action less of a threat than that individual action.

Or does it?

In reply, one could argue that it would be odd to sanction individual thefts on the grounds that the thief took only some predetermined amounts of wealth from those individuals who were in a position to pay for it. The interposition of political majorities does not necessarily insulate the state's decision from all criticism. As James Madison reminds us, political factions often act and vote in ways that allow them to line their own pockets. It hardly counts as a tribute to the democratic process if a minority of wealthy persons is consistently outvoted and outmuscled by those who enjoy the advantage of greater numbers, namely, the poor.

The objection of theft may not be a showstopper, but it can hardly be dismissed on the grounds that the processes of deliberative democracy insulate all of its decisions from substantive attack. The owners of private property are entitled to nothing more than the protections that deliberative democracy wishes to confer upon them. Outright confiscation is not cleansed simply because it is authorized by a majority, or even supermajority, vote. Progressive taxation is not cut from the same cloth as those forms of collective action that raise the standards of wealth and happiness for all, which is what the state tries to do by supplying certain standard public goods – military defense, a judicial system, police protection, public infrastructure – to all its citizens.

This last observation is fortified when one looks more closely at the unhappiness created by individual acts of theft. Here a proponent of redistribution

might argue that whenever the thief has more use for the stolen goods than their owner does, the theft helps to advance happiness. But that shortsighted calculation ignores the broader dynamics of theft.

If the state were to legalize individual theft, the scope of these activities would sharply increase, as many individuals would forsake productive activities for what once passed as a life of crime. In response, property holders would be forced to hire more armed guards to protect their possessions. Worse, they might avoid theft by prematurely consuming goods that they would otherwise save, thereby depleting the social store of wealth over time. And if consumption is not possible, a property holder can always choose to invest resources in bricks and mortar, which are harder to steal than money.

Theft is therefore a losing proposition on both sides of the ledger. The proper social response is to make it illegal – both for individuals and for the state.

The hard social question is how many resources should be devoted to its elimination. Here the idealist might be tempted to hold that the state simply has a moral and social duty to eradicate *all* forms of theft, including taxation. For our purposes, the critical point is that the destructive cycle wrought by individual theft may be mirrored when the state uses coercive means to redistribute wealth.

Thus the wise citizens of Hong Kong, fearful of expropriation after the Chinese takeover in 1997, invested large sums of free cash into their new local airport, where it was relatively insulated from expropriation. Allowing the state to steal from the wealthy alters the full range of productive and consumptive activities – generally for the worse.

Here again, a note of caution is need-

ed. I have no doubt that the strong sense that motivates private charitable transfers affords some political margin of error against certain state-mandated transfers designed to help those in dire need. Most people who are taxed would be prepared to devote for religious or moral reasons some fraction of their wealth to the alleviation of poverty and misery. Once the state undertakes that role, private citizens can reduce their amount of private giving to offset the state exaction. Hence the public system of support displaces the ordinary system of private charity, but meets with relatively little resistance so long as the reductions in private giving are available.

Yet the margin for error in this scenario is not infinite. Raise the level of transfer payments for public services too high, and the private adaptive response will be less charity – such that it will no longer be able to offset the increased burden of public taxation. Matters only get worse if the transfer payments in question have, as is so often the case, little to do with the alleviation of poverty and hardship in our midst.

At this point, Madison's warning about factions becomes pertinent. How taxes are spent generally depends on the kind of bare-knuckled political struggle that makes Washington politics so ugly today. Losers from proposed legislation can lobby furiously against it. But lobbying is always a two-way street that allows well-organized beneficiaries to mount a political campaign in response.

Once the government halls are open for business, anyone can apply for grants. Farmers can obtain their special subsidies; small-business men can opt for theirs; corporate welfare can enrich well-heeled stockholders; senior citizens can cash in on a rich set of retirement and medical benefits denied to

their younger and poorer brethren. Public cynicism can mount, as it has mounted, in response to the transparent efforts to make it appear as though every giveaway on the map should be extolled in the name of the public good.

Why believe that the total sum of state and federal redistributive activities provides any net benefit to the poor, who pay through the nose for every major subsidy only to receive relatively paltry welfare benefits in exchange?

In the struggle between different political factions over transfer payments, as with individual theft, two sides are engaged in either blocking or securing wealth transfers. Their combined activities result in a net diminution of wealth across the board, whether peanut farmers or tobacco farmers win their vaunted subsidies.

The parallel to individual theft goes one step further. Once wealth redistribution is fair game, people will alter their patterns of consumption and investment. They will leave less to the next generation out of fear that the estate tax will gobble up their bequests. And they will hire the finest lawyers and planners to navigate their private fortunes safely through the arcane niceties of the tax code.

My conclusion is simple: any effort to secure redistribution necessarily reduces the total stock of wealth. And it is not likely to result in transferring wealth to the poor.

If, as I believe, restitution and redistribution are more often than not misguided, even dangerous, strategies for social reform, what alternatives exist?

I can think of two underappreciated lines of inquiry. The first of these is the use of charitable contributions to assist the poor, even through faith-based initiatives *without* direct government sup-

port. Smaller amounts of state-sponsored redistribution could give families stronger incentives to take care of their wayward members. In addition, any charitable dollar is likely to do more good than a government dollar because voluntary contributors have at least some incentive to monitor how their funds are spent. Finally, reducing government transfers is likely to increase overall wealth, which in turn reduces the demands on the welfare system. Evaluated by its systematic returns, increased charitable spending is no panacea, but it has none of the drawbacks of coercive government programs.

The second line of action comes from a different quarter. The statute books are littered with laws that impose indefensible barriers to entry into product and labor markets. It is easy to find all sorts of regulations that exclude individuals from driving jitneys, braiding hair, or practicing law and medicine. Why is it that Sears, Roebuck can sell lawn mowers but not legal services if it is prepared to stand behind both?

The political forces behind the status quo are formidable. It may well be the case that entrenched interests will block any quick and sudden shift in political fortunes that would block the operation of competitive markets. But however

vexed these transitional issues, the intellectual program is clear: remove barriers to entry in the trades and professions. Removing these obstacles costs the government nothing in direct expenditures. Indeed, it reduces administrative bloat and, through it, tax burdens. In addition, it increases the total level of production in society. In the midst of all the clamor for redistribution, we should not forget our initial point of departure: that ordinary contracts produce gains from trade that are shared by all parties. The lower the level of transactions costs, the higher the velocity of exchanges that move resources from lower- to higher-valued uses. Open entry and freedom of contract expand the opportunity set across the board, and are prey to none of the destructive consequences that mark resort to faction or theft. The nineteenth-century program of trade and labor liberalization makes as much sense in today's Internet age as it did in an era dominated by iron and steel.

John F. Kennedy had it right when he said that a rising tide lifts all boats. And that tide will only rise when we put aside our preoccupation with redress and redistribution – and agree instead to unleash the productive capacities of all our citizens.

Christopher Jencks

Does inequality matter?

The economic gap between rich and poor has grown dramatically in the United States over the past generation and is now considerably wider than in any other affluent nation. This increase in economic inequality has no recent precedent, at least in America. The distribution of family income was remarkably stable from 1947 to 1980. We do not have good data on family incomes before 1947, but the wage gap between skilled and unskilled workers narrowed dramatically between 1910 and 1947, which probably means that family incomes also became more equal. The last protracted increase in economic inequality occurred between 1870 and 1910.

The gap between the rich and the rest of America has widened steadily since 1979. The Census Bureau, which is America's principal source of data on

household incomes, does not collect good data from the rich, but the Congressional Budget Office (CBO) has recently combined census data with tax records to track income trends near the top of the distribution. Figure 1 shows that the share of after-tax income going to the top 1 percent of American households almost doubled between 1979 and 1997. The top 1 percent included all households with after-tax incomes above \$246,000 in 1997. The estimated purchasing power of the top 1 percent rose by 157 percent between 1979 and 1997, while the median household's purchasing power rose only 10 percent.¹ The

¹ Estimates of the absolute change in purchasing power should be treated with extreme caution. The Consumer Price Index suggests, for example, that the purchasing power of the bottom quintile did not change between 1979 and 1997, yet data on food expenditures suggest that the poorest quintile felt it had more discretionary income (see Bruce Hamilton, "Using Engel's Law to Estimate CPI Bias," *American Economic Review* 91 [June 2001]: 619–630) and direct measures of housing conditions and other amenities suggest that the poorest quintile's material standard of living rose (see Susan Mayer and Christopher Jencks, "Do Official Poverty Rates Provide Useful Information about Trends in Children's Economic Welfare?" Levy Institute, Bard College, June 2001, available at <<http://www.jcpr.org>>).

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gap between the poorest fifth of American households and the median household also widened between 1979 and 1997, but the trend was far less dramatic.

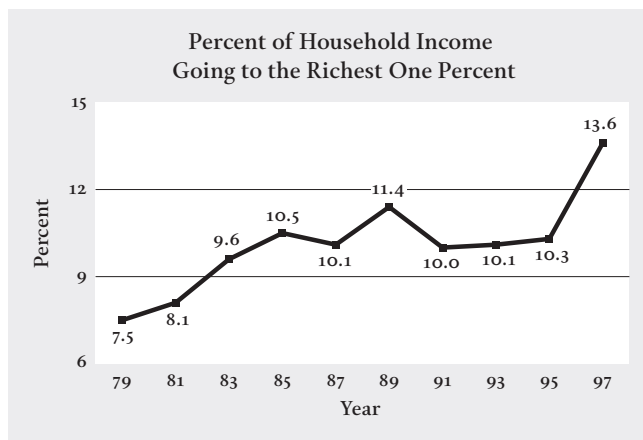
To liberals who feel that economic inequality is unjust or socially destructive, its growth is evidence that America has been headed in the wrong direction. To conservatives who feel either that riches are the best way of rewarding those who contribute the most to prosperity or that a generous welfare state encourages idleness and folly among the poor, the growth of inequality seems either innocuous or desirable. The debate over inequality involves both moral and empirical claims, but because the empirical claims are hard to assess, both sides tend to emphasize moral arguments. But treating inequality as a moral issue does not make the empirical questions go away, because the most common moral arguments for and against inequality rest on claims about its consequences. If these claims cannot be supported with evidence, skeptics will find the moral arguments unconvincing. If the claims about consequences are actually wrong, the moral arguments are also wrong.

The connection between moral obligations and empirical evidence is most obvious in the case of utilitarian morality, which requires everyone to follow rules consistent with the greatest good of the greatest number. Utilitarian morality tells us, for example, that we should not litter even when there is no chance of being punished, because the cost to others usually exceeds the benefit to ourselves. But a moral obligation to follow rules that promote the greatest good of the greatest number does not tell us which specific rules for distributing goods and services produce that result.

If humanity lived entirely on manna that dropped from heaven, and if each additional pound of manna yielded a progressively smaller increase in the recipient's well-being, rulemakers committed to the greatest good of the greatest number would seek to distribute manna equally, at least when recipients had equal needs. But economic goods and services do not drop from heaven. People have to produce these goods and services in order to sell them to one another. How much people produce depends partly on how generously their efforts are rewarded. Rulemakers therefore have to make tradeoffs between the needs of consumers, which are relatively

Figure 1
Changes in the percent of household income going to the richest 1 percent of American households, 1979–1997.

Source: Congressional Budget Office, *Historical Effective Tax Rates, 1979–1997*, September 2001, Table G-1c.



equal, and the motives of producers, who usually produce more when extra effort leads to higher rewards.

The most widely discussed alternative to the utilitarian theory of justice is the theory proposed by John Rawls.² Rawls claimed that when uncertainty is great and downside risks are high, people are – or should be – absolutely risk averse. This assumption led Rawls to believe that if people did not know what position they would occupy in a society they would want to organize the society so as to maximize the well-being of the society’s least advantaged members. If this claim is correct, utilitarian logic also implies that society should maximize the well-being of the least advantaged. Even if most people are not as risk averse as Rawls claimed, they may be sufficiently risk averse to feel that maximizing the position of the least advantaged should be given very high priority in a just society.

But most thoughtful liberals, including Rawls, also recognize that rewarding people for producing more goods and services will often improve the absolute well-being of the least advantaged. Identifying the best strategy for improving the position of the least advantaged therefore requires complex empirical calculations that turn out to be rather similar to the calculations required to achieve the greatest good of the greatest number. The rest of this article assesses various empirical claims about how economic inequality affects both the mean level of well-being and the position of the least advantaged.

Some of the potential costs and benefits of inequality emerge when we contrast the United States with other rich

democracies. One simple way to describe income inequality in different countries is to compute what is called the “90/10 ratio.” To calculate this ratio we rank households from richest to poorest. Then we divide the income of the household at the ninetieth percentile by the income of the household at the tenth percentile. (Comparing the ninetieth percentile to the tenth percentile is better than, say, comparing the ninety-ninth percentile to the first percentile, because few countries collect reliable data on the incomes of either the very rich or the very poor.)

The Luxembourg Income Study (LIS), which is the best current source of data on economic inequality in different countries, has calculated 90/10 ratios for fourteen rich democracies in the mid-1990s. Table 1 shows the results.³ To keep differences between these fourteen countries in perspective I have also included data on two poorer and less democratic countries, Mexico and Russia. If we set aside Mexico and Russia, the big English-speaking democracies are the most unequal, the Scandinavian democracies are the most equal, and Western European democracies fall in the middle. (Italy looks more unequal than the other continental democracies, but the Italian data is somewhat suspect.) Within the English-speaking world the United States is the most un-

3 LIS adjusts household incomes for size-related differences in households’ economic needs using a scale in which, for example, a household of four needs twice as much as a household of one, and a household of nine needs three times as much as a household of one. This scale probably underestimates the additional income needed to maintain a constant level of material well-being and probably overestimates the additional income needed to maintain a constant level of subjective well-being when household size rises.

2 John Rawls, *A Theory of Justice* (Cambridge, Mass.: Harvard University Press, 1971).

Table 1
Income inequality and economic output in
various countries during the 1990s

Country (and year of the ninetieth to the tenth percentile)	Ratio of holdhold income at the 90th to 10th per- centile ^a	GDP per capita as a percent of U.S. level in 1998 ^b	Life expec- tancy at birth (1995 est.) ^c
Scandinavia ^d	2.8	75	77.2
Sweden (1995)	2.6	68	78.9
Finland (1995)	2.7	68	76.6
Norway (1995)	2.8	85	77.8
Denmark (1992)	2.9	79	75.4
Western Europe	3.6	73	77.5
Nether. (1994)	3.2	75	77.5
Germany (1994)	3.2	71	76.6
Belgium (1996)	3.2	74	76.4
France (1994)	3.5	66	78.4
Switz. (1992)	3.6	84	78.5
Italy (1995)	4.8	67	77.6
Brit. Com.	4.3	73	77.7
Canada (1994)	4.0	78	78.2
Australia (1994)	4.3	75	78.0
U.K. (1995)	4.6	67	77.0 ^e
U.S. (1997)	5.6	100	75.7
Middle-income LIS nations			
Russia (1995)	9.4	21 (?)	65.0
Mexico (1998)	11.6	25	NA

^a From <<http://lisweb.ceps.lu/key/figures/ineqtable.htm>> (8/13/01).

^b From U.S. Bureau of the Census, *Statistical Abstract of the United States, 2000*, Government Printing Office, Table 1365. GDP is converted to \$U.S. using purchasing power parity.

^c National Center for Health Statistics, *Health, United States, 2000*, Government Printing Office, 2000, Table 27.

^d All area averages are unweighted arithmetic means.

^e England and Wales.

equal of all. The 90/10 ratio in the United States is twice that in Scandinavia. But even the United States is nothing like as unequal as Russia, Mexico, or

many other Latin American countries.

America's unusually high level of inequality is not attributable to its unusually diverse labor force. Years of schooling are more equally distributed in the United States than in the European countries for which we have comparable data (Sweden, the Netherlands, and Germany). Adult test scores are more unequally distributed in the United States than Europe, partly because American immigrants score so poorly on tests given in English. But disparities in cognitive skills turn out to play a tiny role in explaining cross-national differences in the distribution of earnings. If one compares American workers with the same test scores and the same amount of schooling, the Americans' wages vary more than the wages of *all* Swedish, Dutch, or German workers.⁴

Almost everyone who studies the causes of economic inequality agrees that by far the most important reason for the differences between rich democracies is that their governments adopt different economic policies. There is no agreement about *which* policies are crucial, but there is a fairly standard list of suspects. A number of rich countries have centralized wage bargaining, which almost always compresses the distribution of earnings. Many rich democracies also make unionization easy, which also tends to compress the wage distribution. Some rich democracies transfer a lot of money to people who are retired, unemployed, sick, or permanently disabled,

⁴ Francine Blau and Lawrence Kahn, "Do Cognitive Test Scores Explain Higher U.S. Wage Inequality?" Cambridge: National Bureau of Economic Research, April 2001; and Dan Devroye and Richard Freeman, "Does Inequality in Skills Explain Inequality in Earnings Across Advanced Countries?" Cambridge: National Bureau of Economic Research, February 2001.

while others are far less generous. The United States is unusually unequal partly because it makes little effort to limit wage inequality: the minimum wage is low, and American law makes unionization relatively difficult. In addition, the United States transfers less money to those who are not working than most other rich democracies.

The fact that the American government makes so little effort to reduce economic inequality may seem surprising in a country where social equality is so important. American politicians present themselves to the public as being just like everyone else, and once they step outside their offices, Americans all wear jeans. The way Americans talk and the music they listen to are also affected by egalitarian impulses. But while the tenor of American culture may be democratic, Americans are also far more hostile to government than the citizens of other rich democracies. Since egalitarian economic policies require governmental action, they win far less support in the United States than in most other rich democracies.

Conservatives have argued for centuries that trying to limit economic inequality inevitably reduces both the incentive to work and the efficiency with which work is organized. As a result, they think egalitarian societies have fewer goods and services to distribute than societies that allow the market to determine household incomes. One simple way to test the claim is to ask whether countries that tolerate a high level of inequality really do enjoy a higher standard of living.

Measuring a country's standard of living is not easy. The most widely used measure is probably per capita Gross Domestic Product (GDP), converted to American dollars using what is known as "purchasing power parity" – a system

designed to measure what different currencies actually buy in the countries where they are used. Column 2 of Table 1 shows GDP per capita for the fourteen rich democracies on which LIS provides distributional data. At first glance the data seem to support the conservative case, because the most unequal country, the United States, also has the highest GDP per capita. That fact makes a strong impression on most Americans. But if you compare the other thirteen rich democracies in Table 1 you will find no systematic relationship between inequality and per capita GDP. Britain and Italy, for example, rank just below the United States in terms of inequality, but their GDP per capita is lower than any other country but France. The fact that egalitarian economic policies have no obvious correlation with per capita GDP within Europe or the Commonwealth makes a strong impression on egalitarians in those countries. It also suggests that America's high output per capita may be traceable to something other than our tolerance for economic inequality.

Notice, too, that no rich democracy is as unequal as Mexico or Russia. Some think this is because the combination of affluence and democracy always leads countries to adopt somewhat egalitarian economic policies. Others think the causal arrow runs the other way, and that extreme inequality retards economic growth. This debate is unlikely to be settled soon, because it requires historical evidence that is hard to find in poor countries.

If inequality does not account for America's high GDP per capita, what does? A first step toward answering this question is to decompose economic output into two components: the number of hours worked in different countries ("effort") and the value of the goods and

Table 2
Estimates of economic inequality, output, effort, & efficiency in seven rich democracies for 1998

	U.S.	U.K.	Australia	Canada	France	Germany	Sweden
Inequality (1994 – 1997)							
line 1: 90/10 ratio	5.6	4.6	4.3	4.0	3.5	3.2	2.6
Output (1998)							
line 2: GDP per capita	\$32,184	\$21,673	\$24,192	\$25,179	\$21,132	\$23,010	\$21,799
Effort (1998)							
line 3: % of pop. employed	48.6	45.9	45.8	46.6	38.1	43.5	45.1
line 4: Hrs per worker per yr.	1864	1731	1860	1779	1567	1510	1629
Efficiency (1998)							
line 5: GDP per worker	\$60,106	\$44,280	\$47,558	\$49,007	\$55,714	\$50,616	\$44,000
line 6: GDP per hr.	\$32.25	\$25.58	\$25.57	\$27.55	\$35.55	\$33.52	\$27.01
line 7: GDP per “available” hr.	\$30.81	\$23.95	\$23.51	\$25.26	\$31.38	\$30.38	\$24.77

Source by line: Lines 1 and 2: see Table 1. Line 3: see *Statistical Abstract 2000*, Table 1376. Line 4: see Organization for Economic Cooperation and Development, *OECD Employment Outlook, Statistical Annex*, 2001, 225. Line 5 = line 3/line 4. Line 6 = line 5/line 4. Line 7 = line 6 adjusted to include hours available from those not working but seeking work, assuming that they wanted to work the same number of hours as those actually employed.

services that workers produce per hour (“efficiency”). Table 2 shows such statistics for the United States and six other rich democracies. Americans are more likely to have paid jobs than people in the other six countries, but except in the case of France the difference is fairly small. American workers also seem to put in more hours per year than workers elsewhere, although data on hours worked is not collected in the same way in all countries, so the numbers must be treated gingerly. Still, the estimates of output per hour suggest that while the United States is considerably more efficient than Canada, Australia, Great Britain, and Sweden, it is slightly less efficient than France and Germany.

One obvious objection to this comparison is that unemployment is higher in France and Germany than in the United States. One way to correct for this waste of human resources is to divide economic output by what Table 2 labels “avail-

able” hours – the number of hours actually worked plus the estimated number of hours that those looking for jobs in a given week wanted to work. The last row of Table 2 shows the results of this calculation. After this adjustment is made, the United States, France, and Germany look about equally efficient. If we set the United States to one side, moreover, there is again no obvious correlation between inequality and efficiency in the other six countries.

Another objection to the calculations in Table 2 is that they take no account of cross-national differences in the stock of physical and human capital. This is true, but since one major rationale for tolerating a high level of inequality is that this supposedly encourages capital accumulation and investment, holding America’s advantages in these domains constant would bias the results in favor of equality. The calculations in Table 2 also ignore national differences in natural

resources, but such an adjustment would almost surely make America look worse, not better. Perhaps the most fundamental objection of all is that statistics on GDP take little account of differences in the quality of the services in different countries, since these differences are almost impossible to measure. If America's service sector produces more satisfied customers than the service sector in France or Germany, Table 2 may understate the benefits of inequality.

If American managers had organized the economy in an unusually efficient way, so that American workers were producing significantly more (or better) goods and services per hour than their counterparts in other rich democracies, it would be fairly easy to argue that they deserved their fabulous salaries. Table 2 is obviously not the last word on this issue, but it does not suggest that American workers are producing significantly more per hour than their counterparts in other rich countries. Comparisons that adjust for the stock of physical and human capital show the same thing.⁵ America's high standard of living seems to depend as much on long hours as clever management or clever workers.

The fact that Americans spend so much time working is rather surprising for an affluent nation with a reputation for hedonism. Workers in Germany, France, Japan, and Britain have cut their hours substantially since 1980. Americans cut their hours earlier in the twentieth century but have not done so since 1980. Americans tell pollsters that they would like to work fewer hours, but when they have a choice between short-

er hours and more consumer goods, they mostly seem to opt for consumer goods rather than family time or leisure. This is a legitimate choice, but it has nothing to do with economic efficiency.

Until fairly recently the United States was so much richer than other countries that even the poor lived better in America than elsewhere, leading conservatives to argue that laissez-faire policies benefited everyone in the long run. Today, however, the American poor are no longer the world's most affluent. Tim Smeeding, who directs the LIS, and Lee Rainwater, a Harvard sociologist, have compared the purchasing power of households at the tenth percentile of the income distribution in thirteen rich democracies covered by the LIS. These comparisons provide a pretty good indication of how the poor fare in different countries. Table 3, which is based on their work, shows that the American poor are better off than the poor in Britain or Australia but marginally worse off than the poor in Sweden, Canada, and Finland, and substantially worse off than the poor in Western Europe.

Conservatives often blame American poverty on the existence of an "underclass" that rejects mainstream social norms, does little paid work, and has children whom neither parent can support. It is certainly true that poor American households include fewer working adults than affluent American households. This is true in every rich country for which we have data. But when Lars Osberg, an economist at Dalhousie University, compared poor households in the United States, Canada, Britain, Sweden, France, and Germany, he found that the poor American households worked far more hours per year than their counterparts in the other five

*Does
inequality
matter?*

5 Robert Hall and Charles Jones, "Why Do Some Countries Produce So Much More Output per Worker than Others," *Quarterly Journal of Economics* 114 (1999): 83–116.

Table 3
Purchasing power of households at the 10th and 90th percentiles of each nation's distribution relative to households at the same percentile in the United States in the same year, 1992 – 1997

Country (and year)	Purchasing power as a percent of the U.S. level in the same year		
	10th percentile	90th percentile	Average of all percentiles
Scandinavia	112	57	77
Sweden (1995)	103	49	67
Finland (1995)	105	53	73
Norway (1995)	128	68	88
Denmark (1995)	110	59	80
Western Europe	119	73	88
Neth. (1994)	110	64	76
Germany (1994)	113	67	82
Belgium (1996)	121	73	80
France (1994)	110	71	84
Switz. (1992)	141	89	116
Commonwealth	94	73	80
Canada (1994)	105	80	92
U.K. (1995)	85	68	72
Australia (1994)	87	71	76
U.S. (1997)	100	100	100

Source: Columns 1 and 2 are from Timothy Smeeding and Lee Rainwater, "Comparing Living Standards Across Countries: Real Incomes at the Top, the Bottom, and the Middle" (paper prepared for a conference on "What Has Happened to the Quality of Life in America and Other Advanced Industrial Nations?" Levy Institute, Bard College, Annandale-on-Hudson, N.Y., June 2001). Local currencies were converted to dollars using their estimated purchasing power parity. Area averages are unweighted arithmetic means. Column 3 is calculated from the national means of the logarithms of after-tax household income, using data provided by Rainwater.

countries.⁶ This finding suggests that what distinguishes the United States from the other rich democracies is not the idleness of the American poor but the anger that idleness inspires in more affluent Americans, which helps explain the stinginess of the American welfare state.

If Rawls is right, disinterested rulemakers in all societies should be trying to maximize the well-being of the least advantaged. If you accept that claim, Table 3 suggests that Western European countries are doing a better job than the United States and that Western European countries are more just. But if you are a utilitarian whose goal is to maximize the average level of well-being, the situation is not so clear. If you want to compare the average level of well-being in countries with different distributions of income, you need some way of comparing the value people at different points in the income distribution assign to additional after-tax income. Table 3 suggests, for example, that poor Canadians have 5 percent more purchasing power than their American counterparts, while affluent Americans have 25 percent more purchasing power than affluent Canadians. If your goal is to achieve "the greatest good of the greatest number," you need some way of deciding whether the 25 percent advantage of affluent Americans over affluent Canadians should count for more or less than the 5 percent advantage of poor Canadians over poor Americans.

When employers want to reward all members of a hierarchical work group equally, they usually raise every member's wage by the same percentage.

6 Lars Osberg, "Labour Supply and Inequality Trends in the U.S.A. and Elsewhere," available at <<http://is.dal.ca/~osberg/home.html>>.

When social scientists measure economic inequality, they too assume that inequality has not changed if everyone's income has risen by the same percentage. Such practices suggest that many people think a 1 percent increase in income is equally valuable to the rich and the poor, even though a 1 percent increase represents a much larger absolute increase for the rich. In what follows I will refer to the assumption that a 1 percent gain is equally valuable at all income levels as the "One Percent Is Always The Same" rule, or the OPIATS rule for short.

The OPIATS rule implies that if my income is \$100,000 and I give \$20,000 of it to the poor, my well-being falls by a fifth. If I divide my \$20,000 equally between ten people with incomes of \$10,000, ten people's well-being will rise by a fifth. The gains from this gift will thus exceed the losses by a factor of ten. The utilitarian case for governmental redistribution almost always reflects this logic: taxing the rich won't do them much harm, and helping the poor will do them a lot of good. If you look at the actual relationship between income and outcomes like health and happiness, the OPIATS rule seldom describes the relationship perfectly, but it comes far closer than a "One Dollar Is Always The Same" rule, which is the only rule under which income inequality does not affect health or happiness.

If we apply the OPIATS rule to the tenth and ninetieth percentiles in Table 3, the percentage gains accruing to those at the ninetieth percentile from living in the United States almost always exceed the percentage gains accruing to those at the tenth percentile from living in Western Europe or Canada. Switzerland is a notable exception. Americans near the bottom of the distribution would have gained far more from living in Switzer-

land in 1992 than Americans near the top would have lost. Column 3 of Table 3 generalizes this logic by comparing households at every point in each country's income distribution to those at the same point in other countries and averaging the percentage differences.⁷ Averaging across the entire income distribution, Switzerland again does substantially better than the United States in 1992, but all the other rich democracies in Table 3 do somewhat worse than the United States.

Up to this point I have been focusing exclusively on what people can afford to buy. While economic goods and services are obviously important, many people believe that inequality also affects human welfare in ways that are independent of any given household's purchasing power. Even if my family income remains constant, the distribution of income in my neighborhood or my nation may influence my children's educational opportunities, my life expectancy, my chance of being robbed, the probability that I will vote, and perhaps even my overall happiness. The remainder of this article tries to summarize what we know about such effects.

Educational opportunities: Increases in economic inequality have raised the value of a college degree in the United States. If all else had remained equal, making a college degree more valuable should increase both teenagers' interest in attending college and their parents' willingness to pay for college. But the growth of economic inequality in America has been accompanied by a change in

⁷ Column 3 is calculated from the differences between national means for the logarithm of after-tax household income adjusted for household size. Comparing medians in different countries yields almost the same results.

the way we finance public higher education. Tax subsidies play a smaller role than they once did, and tuition plays a larger role. Since 1979 tuition at America's public colleges and universities has risen faster than most parents' income.

If American high-school graduates were as well informed and farsighted as economic theory assumes, they would have realized that the monetary value of a college degree was rising even faster than tuition. College attendance would have risen both among children whose parents offered to pay the bills and among children who cover their own costs, who would either have borrowed more or worked longer hours to earn a degree.

But while some students clearly respond to changes in the long-term payoff of a college degree, many do not. Indeed, the reason affluent parents offer to pay their children's college expenses rather than just giving their children cash is that parents fear that if the children got the cash they might spend it on something with more short-term payoff, like a flashy car or a trip around the world. If affluent parents are right in thinking that their seventeen-year-olds have short time horizons, the same is probably true for less affluent high-school graduates whose parents cannot pay their college expenses. Such students are likely to be far more sensitive to changes in tuition than to a change in the hypothetical lifetime value of a BA. Tuition is easily observed and has to be paid now. The lifetime value of a BA is always uncertain and cannot be realized for a long time. Among students who pay their own bills, higher tuition could easily reduce college attendance even when the long-run returns of a college degree are rising.

Table 4 is taken from work by two economists, David Ellwood at Harvard

Table 4

Percent of high-school graduates enrolling in a 4-year college or some other form of postsecondary education within 20 months of graduation, by income quartile: 1980–1982 and 1992

Income quartile	Entered a 4-year college			Entered some other form of post-secondary education		
	1980–82	1992	Change	1980–82	1992	Change
Lowest	29	28	-1	28	32	4
Second	33	38	5	30	32	2
Third	39	48	9	33	32	-1
Highest	55	66	11	26	24	-2
All	39	45	6	29	30	1

Source: David Ellwood and Thomas Kane, "Who Is Getting a College Education? Family Background and the Growing Gaps in Enrollment," in Sheldon Danziger and Jane Waldfogel, eds., *Securing the Future* (New York: Russell Sage, 2000).

and Thomas Kane at UCLA. It shows changes between 1980–1982 and 1992 in the fraction of high-school graduates from different economic backgrounds entering four-year colleges. Among students from the most affluent families, the proportion entering a four-year college rose substantially. Among students from middle-income families, whose families often help with children's college expenses but seldom pay the whole bill, attendance rose more modestly. Students from the poorest quartile were no more likely to attend a four-year college in 1992 than in 1980–1982. This pattern, in which enrollment rises more at the top than at the bottom, is just what we would expect if parents respond to changes in the long-term benefits of college while students respond to changes in short-term costs. It is important to emphasize, however, that the poorest quartile's chances of attending college

did not fall appreciably; they just failed to rise. The poorest quartile was worse off only insofar as higher education constitutes a “positional” good, whose value depends not just on how much you have but how much others have. That remains a contested issue.

If rising economic inequality explained the trends in Table 4, the correlation between parental income and college attendance should have grown fastest in those states where economic inequality grew fastest. Susan Mayer, a sociologist at the University of Chicago, has shown that that is exactly what happened during the 1970s and 1980s.⁸ Overall, growing economic inequality in a state raised college attendance, partly because it was accompanied by increased spending on all levels of public education. The positive effects of growing inequality on college attendance persisted even when Mayer took account of changes in the payoff of schooling in the student’s home state. But in the states where inequality grew the most, the effect of parental income on educational attainment also grew.

Mayer has also shown that the increase in economic inequality between 1970 and 1990 led to greater economic segregation between neighborhoods.⁹ When the rich got richer they evidently moved to affluent suburbs where other rich people were also moving. Income disparities *within* neighborhoods hardly changed. Economic segregation is likely

to be important, because a school’s ability to attract effective teachers turns out to depend largely on its socioeconomic mix. Even when districts with a lot of poor children pay better than nearby districts, as they sometimes do, they seldom attract teachers who are good at raising children’s test scores. Increasing economic segregation is therefore likely to reduce the chances that low-income students will get good teachers.

Life expectancy: People live longer in rich countries than in poor countries, but the relationship flattens out as national income rises. Indeed, the statistics in Table 1 show that life expectancy and GDP per capita are not strongly related in rich democracies. In particular, life expectancy is lower in the United States than in almost any other rich democracy.

Within any given country people with higher incomes also live longer. This relationship flattens out near the top of the income distribution, but the gap between richer and poorer families does not seem to narrow when everyone’s standard of living rises. Despite both rising incomes and the introduction of Medicare and Medicaid, for example, the effects of both income and education on mortality increased in the United States between 1960 and 1986.¹⁰ Class differences in mortality also widened in England between 1930 and 1960, even though the overall standard of living rose and the National Health Service

*Does
inequality
matter?*

8 Susan E. Mayer, “How Did the Increase in Economic Inequality between 1970 and 1990 Affect Children’s Educational Attainment?” *American Journal of Sociology*, forthcoming.

9 Susan Mayer, “How the Growth in Income Inequality Increased Economic Segregation,” Irving Harris Graduate School of Public Policy Studies, University of Chicago, 2001, available at <<http://www.jcpr.org>>.

10 See Harriet Orcutt Duleep, “Measuring Socioeconomic Mortality Differentials over Time,” *Demography* 26 (May 1989): 345–351, and G. Pappas, S. Queen, W. Hadden, and G. Fisher, “The Increasing Disparity in Mortality between Socioeconomic Groups in the United States, 1960 and 1986,” *New England Journal of Medicine* 329 (1993): 103–109.

equalized access to medical care.¹¹ Such facts suggest that the linkage between income and health involves more than material deprivation. Otherwise, doubling everyone's purchasing power would narrow the gap between the top and the bottom.

One reason for the persistent correlation between income and health is that poor health lowers people's earning power. In addition, big medical bills can deplete a family's savings, lowering its unearned income in later years. But while poor health clearly affects income, studies that follow the same individuals over time suggest that income, occupational position, and education also affect people's health. One reason is that members of affluent households are more likely to follow the medical profession's advice. Affluent Americans now smoke far less than poor Americans, for example. Affluent Americans also get a bit more exercise than the poor and are less likely to be overweight. But even when we take these differences into account, much of the correlation between income and life expectancy remains unexplained. Experimental studies that manipulate a monkey's rank in the hierarchy of its troop suggest that rank affects health, and the same is pretty clearly true for humans. But we do not know how much of the association between income and health can be explained in this way.

In 1992 Richard Wilkinson wrote an influential article arguing that a more equal distribution of income improved life expectancy in rich countries.¹² Sub-

11 See Elsie Pamuk, "Social Class Inequality in Mortality from 1921 to 1972 in England and Wales," *Population Studies* 39 (1985): 17–31.

12 Wilkinson summarized his thinking on this issue in *Unhealthy Societies: The Afflictions of Inequality* (London: Routledge, 1996).

sequent work showed that mortality was also lower in American states and metropolitan areas where incomes were more equal. One explanation for this phenomenon is the OPIATS rule. A 1 percent increase in income lowers the odds of dying before the age of sixty-five by roughly the same amount, regardless of what your initial income is. This means that adding \$1,000 to the income of a million poor families while subtracting \$1,000 from the incomes of a million richer families should lower overall mortality. It follows that countries, states, or cities with the same mean income should have lower death rates when this income is more equally distributed. But if this were the only way in which income inequality affected life expectancy, the difference between the United States and Sweden would be quite small.

Wilkinson and his followers believe that inequality also lowers life expectancy independent of its effect on any given household's income, because it changes the social context in which people live. According to Wilkinson, inequality erodes the social bonds that make people care about one another and accentuates feelings of relative deprivation (the social-science term for what people used to call envy). Other epidemiologists take what they call a "materialist" position, arguing that inequality kills because it affects public policy, altering the distribution of education, health care, environmental protection, and other material resources. Either way, if we compare people with the same income – say \$50,000 a year – those who live in places where incomes are more unequal should die younger.

Recent research has raised serious doubts about such claims. As data on more countries and more time periods have become available, the cross-national correlation between economic in-

equality and life expectancy has fallen perilously close to zero. If you look at Table 1 and simply contrast America with other rich democracies, the idea that inequality kills seems to make sense. But if you compare the other rich democracies with one another, you find no consistent association between inequality and life expectancy. Incomes are far more unequal in Canada, Australia, and Great Britain than in Scandinavia, for example, but life expectancy is about the same in these two groups of countries.

Recent work has also raised doubts about the causal link between inequality and life expectancy in American states and cities. In America, both economic inequality and life expectancy are correlated with the percentage of African Americans in a state or city. Blacks die younger than whites no matter where they live, so states with large black populations have above-average mortality rates no matter how their residents' income is distributed. American whites also die younger when they live in a state or a metropolitan area with a large African American population. Once one takes the effects of race into account, the correlation between economic inequality and mortality tends to disappear.¹³

If we want to know whether egalitarian policies would improve people's health, however, we need to ask whether *changes* in economic inequality at the national, state, or local level are associated with *changes* in life expectancy. The answer to this question is "sometimes." When Andrew Clarkwest and I analyzed changes in economic inequality within American states during the 1980s, we found that white mortality rates fell least in the states where inequality in-

creased fastest. That finding was consistent with the Wilkinson hypothesis, although the effect could have been due to chance. But when we extended our analysis back to 1970, the relationship was reversed. That relationship could also have been due to chance.

When Clarkwest and I looked at changes in economic inequality within the rich democracies that participate in the Luxembourg Income Study (LIS), we found that life expectancy had risen everywhere, but it has risen less rapidly in those countries where economic inequality was rising fastest.¹⁴ This was consistent with the Wilkinson hypothesis, and in this case the relationship was too large to blame on chance, at least using conventional statistical standards. Nonetheless, the relationship was weak. Economic inequality in the United States rose by about a sixth between 1979 and 1997.¹⁵ Life expectancy in the United States rose by three years during this period. Had inequality not increased, the LIS data implied that life expectancy in the United States would have risen by an additional 0.3 years. To keep this number in perspective, it helps to remember that Americans in the top 5 percent of the income distribution can expect to live about nine years longer than those in the bottom 10 percent.¹⁶

*Does
inequality
matter?*

14 See Andrew Clarkwest, "Notes on Cross-National Analysis of the Relationship between Mortality and Income Inequality," Malcolm Wiener Center for Social Policy, Harvard University, 2000, available at <<http://www.ksg.harvard.edu/socpol/MWCstdntresearch.htm>>.

15 This estimate assumes that the apparent increase in inequality between 1992 and 1993 was a methodological artifact caused largely by changes in the Census Bureau's data collection and coding procedures.

16 This calculation is based on an analysis of the National Longitudinal Mortality Survey by

13 See also Angus Deaton and Darren Lubotsky, "Mortality, Inequality, and Race in American Cities and States," Cambridge: National Bureau of Economic Research, June 2000.

The apparent effect of even a fairly large change in a nation's income distribution pales by comparison.

We also need to bear in mind that the cross-national correlation between changes in economic inequality and changes in life expectancy may not be causal. Countries that restrained the growth of economic inequality after 1980 were dominated by political parties that felt either politically or morally obligated to protect the interests of their less affluent citizens. Such countries may have done all sorts of other things that made people live longer, like reducing the work week or ensuring that more people got the health care they needed.

Happiness: The relationship between income and happiness is much like the relationship between income and health, except that it is easier to tell whether someone has died than whether they are unhappy. Almost every year since 1972 the General Social Survey (GSS) has asked national samples of American adults the following question:

Taken all together, how would you say things are these days? Would you say that you are very happy, pretty happy, or not too happy?

Those with higher incomes tend to say they are happier than those with lower incomes. This relationship flattens out near the top of the distribution, but not enough to suggest that making the American distribution of income like

Angus Deaton, which shows that men in the highest income group have death rates comparable to men twelve years younger in the lowest income group, and that women in the highest income group have death rates comparable to women six years younger in the lowest income group. My use of Deaton's results to infer overall disparities in life expectancy requires several assumptions that are unlikely to be exactly correct.

Sweden's would have a big effect on happiness. Just as with health, equalizing the distribution of income is only likely to have large effects on happiness if it changes the social context in which people live. If equality strengthens social ties or reduces envy, for example, that could reduce unhappiness significantly.

Empirical evidence for a correlation between equality and happiness remains thin. Michael Hagerty, a social psychologist at the University of California, Davis, has shown that Americans are less likely to say they are happy when they live in cities where incomes are more unequal, but his analysis does not take account of the correlation between economic inequality and racial mix. A team of economists at Harvard and the London School of Economics has shown that Europeans become less satisfied with their lot when their country's income distribution becomes more unequal, but this effect is confined to respondents who identify with the political Left.¹⁷ All this evidence is suggestive, but hardly definitive.

Crime: Several studies have found that violent crime is higher in American metropolitan areas where the distribution of income is more unequal. But these studies have not looked at whether *increases* in inequality are associated with *increases* in crime. For the United States as a whole, trends in economic inequality do not match trends in violent crime at all closely. Inequality hardly changed during the 1960s, when violent crime rose

17 See Michael Hagerty, "Social Comparisons of Income in One's Community: Evidence from National Surveys of Income and Happiness," *Journal of Personality and Social Psychology* 78 (2000): 764–771, and Alberto Alesina, Rafael Di Tella, and Robert MacCulloch, "Inequality and Happiness: Are Europeans and Americans Different?" Cambridge: National Bureau of Economic Research, April 2001.

sharply. Inequality rose in the early 1980s, when violent crime fell. Inequality rose more slowly in the late 1980s, when violent crime rose again. Inequality near the top of the distribution rose in the 1990s, while violent crime fell. None of this proves that changes in the distribution of income have no effect on crime, but it does suggest that trends in violent crime depend largely on other influences.

Political influence: Americans are less likely to vote today than in the 1960s. The Left sometimes blames this decline in turnout on the fact that almost all the benefits of economic growth have been going to a small minority. Parties of the Left in most other countries have made sure that the benefits of growth were more equally distributed. In America, the Democrats have barely discussed the problem. As a result, voters are said to have become convinced that neither party cares about their problems.

Nonetheless, growing economic inequality cannot explain the decline in turnout, because this decline occurred in the early 1970s, well before inequality began to grow. Turnout has hardly changed since 1980.¹⁸ If growing inequality has affected turnout, it must have done so by perpetuating a decline that occurred for other reasons.

The most obvious causal link between turnout and equality runs the other way. If everyone votes, the electorate is by definition representative of the popula-

tion and politicians need to keep all income groups happy. When people stop voting, turnout almost always falls the most among the poorest and least educated. As the income gap between those who vote and the population as a whole widens, politicians have less incentive to push legislation that benefits the lower half of the income distribution. Richard Freeman, an economist at Harvard, has shown that class disparities in presidential turnout increased between 1968 and 1972 and that the same thing happened between 1984 and 1988.¹⁹ I have not seen any evidence on what has happened since 1988.

American political campaigns have also changed in ways that make it riskier for politicians to upset the rich. Until the 1960s most political candidates relied largely on volunteers to staff their campaign offices and contact voters. Now they rely largely on paid staff and television advertising. This change reflects the fact that politicians can raise more money today than in the past. Political contributions have probably risen because government affects more aspects of our lives, so both voters and corporations are willing to spend more money to influence government regulations and spending patterns. Whatever the explanation, people who can contribute money now have more political weight, and people who can contribute time have less. Politicians also know that the

*Does
inequality
matter?*

18 About 62 percent of the voting-age population cast ballots in the three presidential elections conducted during the 1960s. Turnout fell to 55 percent in 1972, 54 percent in 1976, and 53 percent in 1980. Since 1980 presidential turnout has averaged 52 percent, with no clear trend. Off-year congressional elections have followed the same trajectory (U.S. Bureau of the Census, *Statistical Abstract of the United States, 2000*, Government Printing Office,

2000, Table 479). If one allows for the fact that citizens constitute a declining fraction of the voting-age population and the fact that more citizens are disenfranchised because they are – or have been – in prison, turnout among eligible voters may actually have increased slightly since 1980.

19 Richard Freeman, “What, Me Vote?” paper presented at the Workshop on Inequality and Social Policy, Kennedy School of Government, June 2001.

easiest way to raise the money they need is to court affluent contributors. When the share of income going to the top 1 percent rises, politicians have more incentive to raise money from this group. If politicians had to rely exclusively on contributions of less than \$100, they would also have to rely more on volunteers to do a lot of their campaign work.

I began this inquiry by arguing that America does less than almost any other rich democracy to limit economic inequality. As a result, the rich can buy a lot more in America than in other affluent democracies, while the poor can buy a little less. If you evaluate this situation by Rawlsian standards, America's policies are clearly inferior to those of most rich European countries. If you evaluate the same situation using a utilitarian calculus, you are likely to conclude that most American consumers do better than their counterparts in other large democracies. Much of this advantage is due to the fact that Americans spend more time working than Europeans do, but that may not be the whole story.

I also looked at evidence on whether economic inequality affects people's lives independent of its effects on their material standard of living. At least in the United States, the growth of inequality appears to have made more people attend college but also made educational opportunities more unequal. Growing inequality may also have lowered life expectancy, but the evidence for such an effect is weak and the effect, if there was one, was probably small. There is some evidence that changes in inequality affect happiness in Europe, but not much evidence that this is the case in the United States. If inequality affects violent crime, these effects are swamped by other factors. There is no evidence that changes in economic inequality affect

political participation, but declining political participation among the less affluent may help explain why American politicians remained so passive when inequality began to grow after 1980.

My bottom line is that the social consequences of economic inequality are sometimes negative, sometimes neutral, but seldom – as far as I can discover – positive.²⁰ The case for inequality seems to rest entirely on the claim that it promotes efficiency, and the evidence for that claim is thin. All these judgments are very tentative, however, and they are likely to change as more work is done. Still, it is worthwhile to ask what they would imply about the wisdom of trying to limit economic inequality if they were, in fact, correct.

Readers' answers to that question should, I think, depend on four value judgments. First, readers need to decide how much weight they assign to improving the lot of the least advantaged compared with improving the average level of well-being. Second, they need to decide how much weight they assign to increasing material well-being compared with increasing "family time" or "leisure." Third, they need to decide how much weight they assign to equalizing opportunities for the young as against maximizing the welfare of adults. Fourth, they need to decide how much value they assign to admitting more people from poor countries such as Mexico to the United States, since this almost inevitably makes the distribution of income more unequal.

If you are a hard-core Rawlsian who thinks that society's sole economic goal

20 Mayer's finding that inequality raises educational attainment among the affluent is a partial exception, since the increase among the affluent is larger than the decline among the poor, making the net effect on educational attainment positive.

should be to improve the position of the least advantaged, European experience suggests that limiting inequality can benefit the poor. If you are a hard-core utilitarian, European experience suggests – though it certainly does not prove – that limiting inequality lowers consumption. But European experience also suggests that lowering inequality reduces consumption partly by encouraging people to work fewer hours, which many Europeans see as a good thing. If you care more about equal opportunity for children than about consumption among adults, limiting economic inequality among parents probably reduces disparities in the opportunities open to their children.

All things considered, the case for limiting inequality seems to me strong but not overwhelming. That is one reason

why most rich societies are deeply divided about the issue. Yet given the centrality of redistribution in modern politics, it is remarkable how little effort rich societies have made to assemble the kinds of evidence they would need to assess the costs and benefits of limiting inequality. Even societies that redistribute a far larger fraction of their GDP than the United States spend almost nothing on answering questions of this kind. Answering such questions would require collecting better evidence, which costs real money. It would also require politicians to run the risk of being proven wrong. Nonetheless, moral sentiments uninformed by evidence have done incalculable damage over the past few centuries, and their malign influence shows no sign of abating. Rich democracies can do better if they try.

*Does
inequality
matter?*

James F. Crow

*Unequal by nature:
a geneticist's perspective
on human differences*

In February of 2001, Craig Venter, president of Celera Genomics, commenting on the near-completion of the human genome project, said that “we are all essentially identical twins.” A news headline at the time made a similar point: *Are We All One Race? Modern Science Says So*. In the article that followed, the author quoted geneticist Kenneth Kidd: “Race is not biologically definable, we are far too similar.”

Venter and Kidd are eminent scientists, so these statements must be reasonable. Based on an examination of our DNA, any two human beings are 99.9 percent identical. The genetic differences between different groups of human beings are similarly minute.

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Still, we only have to look around to see an astonishing variety of individual differences in sizes, shapes, and facial features. Equally clear are individual differences in susceptibility to disease – and in athletic, mathematical, and musical abilities. Individual differences extend to differences between group averages. Most of these average differences are inconspicuous, but some – such as skin color – stand out.

Why this curious discrepancy between the evidence of DNA and what we can clearly see? If not DNA, what are the causes of the differences we perceive between individuals and between groups of human beings?

DNA is a very long molecule, composed of two strands twisted around each other to produce the famous double helix. There are forty-six such DNA molecules in a human cell, each (along with some proteins) forming a chromosome. The DNA in a human chromosome, if stretched out, would be an inch or more in length. How this is compacted into a microscopic blob some 1/1000 inch long without getting hopelessly tangled is an engineering marvel that is still a puzzle.

The “business” part of the DNA, the part that carries genetic information, is the sequence of nucleotides, or bases, in

the molecule. There are four of these, commonly designated as A, G, T, and C. (I could tell you what these letters stand for, but you wouldn't understand this essay any better if I did, so I won't.)

In the double helix, there are four kinds of base pairs: AT, GC, TA, and CG. The specific pairing rules – A with T and G with C – are dictated by the three-dimensional structure of the bases.

In a chromosome, the base pairs are in a precise sequence, and the orderly process of cell division assures the reproduction of this sequence with remarkably few errors. Chromosomes occur in pairs, one member of each pair from each parent, and the DNA sites in the two corresponding chromosomes match up. We have twenty-three pairs of chromosomes, or a total of forty-six, as previously mentioned, in each cell. These forty-six chromosomes contain about six billion base pairs. If we randomly choose a pair of bases from corresponding sites in two persons, 99.9 percent of the time they will be the same. This percentage depends only slightly on whether the two people are from the same or from different continents, from the same or from different population groups.

In order to make sense of how the DNA of human beings can be so similar, despite all the important visible and physiological differences among individuals and groups, it is helpful to recount our evolutionary history.

All mammals, including ourselves, are descended from an ancestral species that lived about one hundred million years ago. In our mammalian ancestry an average base has changed, say from an A to a T, at the almost unbelievably slow rate of about one change per billion years. This means that only a small fraction of the bases, one hundred million divided by one billion, or 1/10, have changed during

that time. As a result, we share roughly 90 percent of our DNA with mice, dogs, cattle, and elephants.

Coming closer to home, the DNA of human beings and chimpanzees is 98 to 99 percent identical. The differences between us that we (and presumably the chimps) regard as significant depend on only 1 or 2 percent of our DNA.

Much of human DNA is very similar to even more remote ancestors: reptiles, invertebrates, and even plants. All living things share many functions (e.g., respiration) going back to a very distant past. Most of our DNA determines that we are human, rather than determining how we are different from any other person. So it is not so surprising that the DNA of any two human beings is 99.9 percent identical.

What produces variability between individual organisms – and makes possible evolutionary change – is errors in the DNA copying process. Sometimes, because of this, one base is changed to another – it mutates. Among the six billion base pairs each of us inherits from our parents, a substantial number – a hundred or more – are new mutations.

How can we reconcile this large number with the extremely slow rate of evolutionary change? The explanation is that only a tiny fraction of mutations persist over time. Some mutations survive as a matter of either luck or – if the mutation confers a biological advantage – natural selection. Even if advantageous, an individual mutation has little chance of surviving a long evolutionary trip. The slow rate of evolutionary change explains why we mammals are so similar in our DNA.

Molecular studies of DNA have been extremely fruitful in working out the evolutionary history of life. Much of what we know about human ancestry comes from DNA studies, supplemented

by a rather spotty fossil record. The DNA evidence strongly supports the idea that the human species originated in Africa, and that European and Asiatic populations – indeed, all non-Africans – are descended from a small number of migrants from Africa. The strongest evidence for this is that Africans are more variable in their DNA than are other populations.

Analysis of DNA allows us to measure with some precision the genetic distance between different populations of human beings. By this criterion, Caucasians and Asians are relatively similar, whereas Asians and Africans are somewhat more different. The differences between the groups are small – but they are real.

DNA analysis has provided exciting new answers to old questions. But its findings can also be misleading. Take the case of men and women and sex chromosomes. Females have two X chromosomes, while males have an X and a Y. The Y chromosome makes up perhaps 1 percent of the DNA. But there is very little correspondence between the Y and the other chromosomes, including the X. In other words, the DNA of a human male differs as much from that of a female as either does from a chimpanzee of the same sex. What does this mean? Simply that DNA analysis, which has given us a revolutionary new understanding of genetics and evolution, doesn't give sensible answers to some contemporary questions that society is interested in.

Most of the differences that we notice are caused by a very tiny fraction of our DNA. Given six billion base pairs per cell, a tiny fraction – 1/1000 of six billion base-pairs – is still six *million* different base pairs per cell. So there is plenty of room for genetic differences among us. Although we differ from each other in a

very tiny proportion of our DNA, we differ by a large number of DNA bases.

Some noteworthy evolutionary changes in human beings have occurred relatively rapidly, despite the slow overall rate of change at the DNA level. The difference between the skin color of Africans and Europeans probably evolved in less than fifty thousand years, an adaptation to differences in climate. Still more rapid were changes in genes that confer resistance to malaria in Africa and Mediterranean regions; it only took between four and eight thousand years for the new genes to evolve. What genetic analysis reveals is that some of the genetic changes that seem so significant to us depended on a very tiny fraction of our DNA.

But, as I said, this tiny fraction is still a very large number of bases. No two human beings are alike in the traits they possess. Some are tall, others are short; some are stocky, others thin; some are gifted musically, others tone deaf; some are athletic, others awkward; some are outgoing, others introverted; some are intelligent, others stupid; some can write great poetry or music, most cannot. And so on.

To understand our differences, we need to consider not just DNA, but its cellular products as well. This area of study is new, but it is progressing rapidly. The emphasis is changing from DNA sequences to genes. A gene is a stretch of DNA, usually several thousand base pairs long. The function of most genes is to produce proteins. The genome sequencing project has revealed that we humans have thirty to forty thousand genes. But since a gene often produces more than one kind of protein, sometimes producing different kinds for different body parts, the number of kinds of protein is more like one hundred thousand.

We share a number of genes with

chimpanzees, genes that make us primates rather than elephants or worms. Evolutionary scientists believe that many of the differences that we observe between ourselves and chimpanzees involve changes in the amount rather than in the nature of gene products. Human beings and chimpanzees share proteins that produce body hair and brains, but in chimpanzees these proteins produce more hair and less brains. Why this should be so is still far from being fully understood. But this is a research area that is advancing very rapidly, and there are good genetic leads to be followed up.

Of course, not every human difference has a genetic cause. Many are environmental, or are the result of interactions between genes and environment. Even genetically identical twins develop into distinct individuals.

The ability to learn a language is largely innate, built into the nervous system of all normal people, as demonstrated so beautifully in the effortless way in which young children learn to speak. But the particular language any individual learns obviously depends on the social setting. Mozart was a great composer partly because of his genes and partly because of his training. Ramanujan had a great talent for mathematics, but without his being exposed to a textbook – not a very good one, by the way – he could never have made his astounding discoveries. Michael Jordan has a talent for basketball, but it would never have developed had he grown up among the Inuits.

Just as there are great differences among individuals, there are average differences, usually much smaller, between groups. Italians and Swedes differ in hair color. Sometimes the differences are more conspicuous, such as the contrasting skin color and hair shape of Africans

and Europeans. But, for the most part, group differences are small and largely overshadowed by individual differences.

Biologists think of races of animals as groups that started as one, but later split and became separated, usually by a geographical barrier. As the two groups evolve independently, they gradually diverge genetically. The divergences will occur more quickly if the separate environments differ, but they will occur in any case since different mutations will inevitably occur in the two populations, and some of them will persist. This is most apparent in island populations, where each island is separate and there is no migration between them. Each one has its own characteristic types. In much of the animal world, however, and also in the human species, complete isolation is very rare. The genetic uniformity of geographical groups is constantly being destroyed by migration between them. In particular, the major geographical groups – African, European, and Asian – are mixed, and this is especially true in the United States, which is something of a melting pot.

Because of this mixing, many anthropologists argue, quite reasonably, that there is no scientific justification for applying the word “race” to populations of human beings. But the concept itself is unambiguous, and I believe that the word has a clear meaning to most people. The difficulty is not with the concept, but with the realization that major human races are not pure races. Unlike those anthropologists who deny the usefulness of the term, I believe that the word “race” can be meaningfully applied to groups that are partially mixed.

Different diseases are demonstrably characteristic of different racial and ethnic groups. Sickle cell anemia, for example, is far more prevalent among people of African descent than among Euro-

peans. Obesity is especially common in Pima Indians, the result of the sudden acquisition of a high-calorie diet to which Europeans have had enough time to adjust. Tay-Sachs disease is much more common in the Jewish population. There are other examples, and new ones are being discovered constantly.

The evidence indicating that some diseases disproportionately afflict specific ethnic and racial groups does not ordinarily provoke controversy. Far more contentious is the evidence that some skills and behavioral properties are differentially distributed among different racial groups. There is strong evidence that such racial differences are partly genetic, but the evidence is more indirect and has not been convincing to everyone.

To any sports observer it is obvious that among Olympic jumpers and sprinters, African Americans are far more numerous than their frequency in the population would predict. The disproportion is enormous. Yet we also know that there are many white people who are better runners and jumpers than the average black person. How can we explain this seeming inconsistency?

There is actually a simple explanation that is well known to geneticists and statisticians, but not widely understood by the general public or, for that matter, by political leaders. Consider a quantitative trait that is distributed according to the normal, bell-shaped curve. IQ can serve as an example. About one person in 750 has an IQ of 148 or higher. In a population with an average of about 108 rather than 100, hardly a noticeable difference, about 5 times as many will be in this high range. In a population averaging 8 points lower, there will be about 6 times fewer. A small difference of 8 points in the mean translates to several-fold differences in the extremes.

Asian Americans represent about 12 percent of the California population, yet they represent 45 percent of the student body at the University of California at Berkeley. Asians have only slightly higher average SAT scores than Caucasians, but the university's policy of admitting students with the highest SAT scores has yielded a much larger proportion from the group with the higher mean.

Two populations may have a large overlap and differ only slightly in their means. Still, the most outstanding individuals will tend to come from the population with the higher mean. The implication, I think, is clear: whenever an institution or society singles out individuals who are exceptional or outstanding in some way, racial differences will become more apparent. That fact may be uncomfortable, but there is no way around it.

The fact that racial differences exist does not, of course, explain their origin. The cause of the observed differences may be genetic. But it may also be environmental, the result of diet, or family structure, or schooling, or any number of other possible biological and social factors.

My conclusion, to repeat, is that whenever a society singles out individuals who are outstanding or unusual in any way, the statistical contrast between means and extremes comes to the fore. I think that recognizing this can eventually only help politicians and social policymakers.

These are times of very rapid change in our understanding of biological processes. The genome project is but one example. At the same time, we are getting much closer to a deep understanding of the nervous system and of human behavior. Medical knowledge improves, as does data collection and computer

analysis. All of these tell us more about individual and group differences. What will be the impact of this new knowledge on societal issues? What are the political implications of modern biology?

We have seen that the DNA sequence similarities revealed by the genome project, valuable as these are for answering many interesting and important questions, are misleading in regard to important human differences. But this situation is rapidly changing. The current emphasis goes beyond simple DNA sequences to identifying the individual genes, their products, and their complex interactions. At the same time, not only the kinds of gene products (usually proteins) but their relative amounts are being investigated by much sharper new tools. Genes differ greatly in their productivity, including differences in activity in different parts of the body.

In the near future, biologists will be able to tell us much more than we now know about the genetic and environmental causes of human differences. The most obvious and immediate human benefits will be in medicine. We can foresee the time when many – we can hope most – of our individual susceptibilities to disease will be understood, so that the disease can be predicted in advance, allowing doctors to anticipate and tailor treatments for the particular person. Small steps in this direction have already been made. New treatments are under development. As a result of our genetic understanding, we also now better understand how to manipulate the environment in order to help prevent disease.

At the same time, the study of gene products and their regulation is being extended to normal traits. We can expect that the molecular biology of the future, perhaps the quite near future, will provide precisely the kind of information

that in the past has depended on observation and statistical analysis of often vaguely defined traits. We shall be able, as individuals, to know a great deal about our own genetic makeup.

The magnificent advances in molecular biology will bring new depths of understanding of human differences, normal and pathological, and the extent to which these are genetic or environmental – or, as usually will be the case, both. Whether society will accept this knowledge willingly and use it wisely I don't know. My hope is that gradual progress, starting with small beginnings, can lead to rational individual behavior and thoughtful, humanitarian social policies.

It is important for society to do a better job than it now does in accepting differences as a fact of life. New forms of scientific knowledge will point out more and more ways in which we are diverse. I hope that differences will be welcomed, rather than accepted grudgingly. Who wants a world of identical people, even if they are Mozarts or Jordans?

A good society ought to provide the best kind of environment for each person and each population. We already do this in part. We give lessons to musically gifted children. We encourage athletes and give them special training (and sometimes dubious drugs). Students elect courses according to their abilities and interests. We have special classes for those with disabilities, and such classes are becoming more specific as the causes of the disabilities are understood.

We cannot, of course, tailor-make a special environment for every individual, but we can continue to move in this direction. Finding a genetic basis for a trait doesn't mean that environment is unimportant. Indeed, more environmental influences on the human organ-

ism are constantly being discovered, often through genetic studies.

A test of our democratic institutions will be the degree to which people can accept all our differences and find ways to fit them into a smooth-working, humanitarian society. And I argue that we should strive not only for maximum personal satisfaction but for maximum contribution; each of us owes society the fruits of our special gifts. I believe strongly that research into the genetic and environmental causes of human differences should continue and be supported. The newer procedures brought about by molecular advances and computers will greatly accelerate discoveries.

I believe that knowledge, even unpleasant knowledge, is far preferable to ignorance. I hope that American society can be less fearful of learning the truth about biological inequalities and more courageous in using discoveries in ways that are humanitarian and promote human welfare.

The question of equal opportunity versus equal outcomes becomes particularly vexing in those occupations and professions for which only a small fraction of a population can qualify. I have already mentioned the gross overrepresentation of African Americans among Olympic runners. This is closer to a true meritocracy than anything else I can think of: a stopwatch is color-blind. In this case, there seems to be no social purpose in demanding equal racial representation.

In some important professions, such as physics and engineering, Asian Americans are overrepresented and African Americans underrepresented. We presumably get better research because of this. This may or may not outweigh the inequity of unequal group representation. That is a social decision.

What about physicians? There may well be social considerations, perhaps temporary ones in our society, that would make race more important than test scores in selecting students for medical schools.

To achieve political and social equality it is not necessary to maintain a fiction that important human differences do not exist. The great evolutionist Theodosius Dobzhansky said it well: "People need not be identical twins to be equal before God, before the law, and in their rights to equality of opportunity."

I have emphasized that people differ, and differ greatly. They differ not only in shapes and sizes, but also in abilities and talents. They also differ in tastes and preferences. As Shaw said, "Do not do unto others as you would that they should do unto you. Their tastes may not be the same." Society's business, I think, is not to minimize individual differences. We shouldn't try to fit people into one mold.

While I expect that science will continue to provide us with further evidence of human variability, and while I welcome such variability as a source of social enrichment, there are some kinds of human variability that we could well do without. I refer to serious, painful, debilitating diseases. Many of these are the result of an unlucky throw of the genetic dice. Already there are ways of discovering, preventing, and treating some of them. More treatments are sure to come. I hope they will be accepted willingly and used responsibly. I for one would be content if the genes for Tay-Sachs disease and Duchenne muscular dystrophy were to become extinct, along with the malaria parasite and AIDS virus. I hope the great humanitarian benefits that could come from genetic research will not be held up by fears of possible future misuse.

*James F.
Crow
on
inequality*

Let me leave the last word for Jim Watson, co-discoverer of the double helix and a major figure in the genome project:

If the next century witnesses failure, let it be because our science is not yet up to the job, not because we don't have the courage to make less random the sometimes most unfair courses of human evolution.

Martha C. Nussbaum

Sex, laws, and inequality: what India can teach the United States

In every house there is fear.
Let's do away with that fear.
Let's build a women's organization.

– “Mahila Samiti” (“A Women’s Organization”), song sung all over India in women’s groups

Hanuffa Khatoon, a citizen of Bangladesh and also an elected official of that nation’s Union Board, arrived at Howrah Station in Calcutta, India, on the afternoon of February 26, 1998, planning to catch the Jodhpur Express that

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night. Because her sleeping-car reservation had not yet been confirmed, she contacted the train ticket examiner, who asked her to wait in the ladies’ waiting room. At around 5 P.M., two railway officials came to confirm her sleeping berth; they also offered to show her to the station’s restaurant, where she could get dinner before the departure. Ms. Khatoon followed a station-boy to the restaurant and ordered some food, but immediately began to vomit. She returned to the ladies’ waiting room, quite ill. The railway officials then offered to take her to the official station hotel managed by the Railways Board. She insisted on checking their credentials first, but when the official on duty at the ladies’ waiting room told her that their credentials were in order, she agreed to go. In the hotel room she was brutally gang raped for several hours by a group of four station employees. Finally she escaped and returned to the platform, bleeding and in a state of shock. There she found another railway official who pretended to assist her. He said he would take her to his wife, who would take care of her until she could get another train in the morning. At the wife’s alleged residence she was brutally gang raped again, and two of the employees tried to suffocate her. Hearing

her cries, the landlord called the police, who finally rescued her.¹

What is significant – and specifically Indian – about this story, however, is not the sad fact of gang rape, familiar throughout recorded history in all nations. What is significant is its dénouement.

Two years later, in an unprecedented judgment, Ms. Khatoon won a large damage award from the Railways Board. It was a landmark case in which the Supreme Court of India declared rape to be a violation of the fundamental right to live with human dignity, under both the Indian Constitution and the Universal Declaration of Human Rights. “Rape,” wrote the Court, “is a crime not only against the person of a woman, it is a crime against the entire society. It destroys the entire psychology of a woman and pushes her into deep emotional crisis. Rape is therefore the most hated crime. It is a crime against basic human rights and is violative of the victim’s most cherished right, namely, right to life which includes right to live with human dignity....”

It is a mid-April evening in Bihar, in northeastern India. A woman is sitting with her brother in the backyard of her mud hut in a poor area of this state, one of the most corrupt and anarchic in the nation. Women have traditionally had little political power in Bihar, where, in some regions, the sex ratio is as low as 75 women to 100 men – a figure indicative of the differential nutrition and health care of girls, sex-selective abortion, and, probably, outright infanticide. But Poonam Devi, mother of two girls, is a candidate for election to her *panchayat*, or local council, and she is arranging the

voting slips, with her number on them, to be given to voters on election day.² A gentle, soft-spoken woman, Poonam Devi has for two years been president of a woman’s collective, where she has helped to arrange loans for all fifteen members of her group.

What is most astonishing about Poonam Devi’s campaign, however, is not the fact of her candidacy – but the fact that she is running against her husband, who is affiliated with the BJP (Bharatiya Janata Party, the currently dominant party nationwide, with a Hindu fundamentalist program). Originally it was thought that this constituency would be among those reserved for women in the current election, so Poonam Devi’s husband groomed her for candidacy, assuming that he would be unable to run. But when the electoral plan was announced, the constituency was not reserved for women, and the husband could run. But Poonam Devi decided to run anyway, with support from her parents and brothers. Her husband asked her to withdraw, but she refused. He is angry. After all, he says, she is a weak and insignificant candidate next to him. He is educated, he owns some land, he has been a teacher – and, he points out, he is even unemployed, so he has lots of time for the council. A reporter from the national news media asks Poonam Devi, “Why are you fighting against your husband?” She questions right back: “Why can’t I fight the elections, husband or no husband? Why can’t a woman and a man be candidates from the same family?” Her platform focuses on unemployment, the old-age pension, and the insecure economic

2 In Indian elections, voters receive slips with the symbol of each candidate, and they then deposit the slip of their choice in the box – a procedure designed to make voting easy for illiterate voters.

1 *Chairman, Railway Board v. Mrs. Chandrima Das* AIR 2000, SC 988.

position of single women and widows.³

The outcome of Poonam Devi's candidacy remains unclear. What is clear, however, is that the Seventy-Second and Seventy-Third Amendments to India's constitution, which establish a bold program of affirmative action for women in the local *panchayats*, are bringing large numbers of women into politics all over India, with clear results for the salience of issues pertaining to the welfare of women and children.

Inequality on the basis of sex is a staggering problem worldwide. India is hardly unique in this regard. Women in all nations – including the United States – still suffer serious inequalities in at least some central areas of human life.

Gang rape is hardly a problem indigenous to Calcutta: it is the regular fare of U.S. courts. (A recent showing of *Law and Order* reruns managed to fill an entire evening with programs on this one theme, most of them based on real stories.) And it is just one especially terrible aspect of the general worldwide problem of violence against women, a problem that seems to be particularly grave in the United States. (According to a report recently published in the *Journal of the American Medical Association*, one-fifth of the Massachusetts high-school girls studied have suffered some type of violence from a date, either assault or sexual violence. A recent national study concludes that 25 percent of adult women have experienced violence from a romantic partner. The Justice Department estimates that more than 1.5 million U.S. women experience physical or sexual violence each year from a

boyfriend, husband, or date.⁴)

Nor is lack of political power a distant difficulty. Women in the United States hold only 13.8 percent of its national legislative seats – one of the lowest figures among the developed nations, according to the *Human Development Report 2001*. And in no nation does the figure come very close to equality: Sweden and Denmark take the lead, with 42.7 percent and 37.4 percent, respectively; outside the Nordic countries, the highest figures are for the Netherlands at 32.9 percent and Germany at 30.4 percent; highest in the developing world is South Africa at 27.9 percent.

But women are also contesting age-old forms of subordination with increasing success, creating innovative proposals for change in both custom and law. And sometimes nations that are widely perceived as lagging behind the “advanced democracies” of the United States and Europe can actually take the lead, with bold measures like those that altered the lives of Hanuffa Khatoon and Poonam Devi.

In this essay I shall look at the problem of women's inequality through the lens of today's India, a nation with both enormous gender problems and rich political creativity. I shall begin by offering a thumbnail sketch of the situation of women in India and of the Indian constitutional tradition, which has been remarkably woman-friendly, and discuss conceptions of equality and the role of law that offer rich resources for those seeking to advance women's position in society. I shall then return to the cases with which I began, showing how a reasonable conception of affirmative action and a reasonable openness to the norms

3 See Mukul Sharma, “Bihar: Making of a *Panchayat* Election,” *Economic and Political Weekly*, 12 May 2001.

4 Erica Goode, “Study Says 20% of Girls Reported Abuse by a Date,” *New York Times*, 1 August 2000, A10.

of the international community (both rather lacking in current U.S. politics) have enabled India to progress.

It is extraordinarily difficult to sum up succinctly the situation of women in India, since there is probably no nation in the world with greater internal diversity and plurality. In what follows I shall be mentioning some of those differences (of caste, religion, regional background, wealth and class, and still others). All generalizations cover multiple differences.

India celebrated the fiftieth anniversary of its independence from Britain on August 15, 1997. It is the world's largest democracy, with a population of 846.3 million. It is a constitutional parliamentary democracy, with a written account of Fundamental Rights containing the abolition of untouchability and an elaborate set of equality and nondiscrimination provisions. Its legal system is in some respects similar to (and modeled on) that of the United States, combining a basically common-law tradition with the constraints of a written constitution including the extensive list of Fundamental Rights. Its Supreme Court, like ours, is the ultimate interpreter of these rights.

India's Constitution is in some ways very attuned to issues of sex equality, which were prominently debated when the Constitution was adopted in 1950. The framers of the Constitution were very conscious of deeply entrenched inequalities, both those based on caste and those based on sex, and they made the removal of them one of their central goals. The text of the Constitution is in many ways exemplary in its treatment of issues of gender and sex, particularly in the section dealing with Fundamental Rights.

Article 14 says that the state shall not

deny to any person "equality before the law or the equal protection of the laws." Article 15 prohibits state discrimination "on grounds only of religion, race, caste, sex, place of birth or any of them." Other rights that are highly relevant to sex equality include Article 13 (invalidating all laws inconsistent with the Fundamental Rights); Article 16 (equality of opportunity in public employment); Article 19 (protecting freedom of speech and expression, freedom of association, freedom of travel, freedom of residence, and freedom to form labor unions); Article 21 (stating that no citizen shall be deprived of life or liberty "except according to procedure established by law"); Article 23 (prohibition of traffic in human beings and forced labor); and Article 25 (freedom of conscience and religion). (Article 17 abolishes untouchability: "its practice in any form is forbidden.")

The understanding of equality in the Constitution is explicitly aimed at securing substantive equality for previously subordinated groups. The framers carefully distanced their conception from the idea, already familiar in those days, that equality requires treating everyone the same and not using race or sex as grounds for any type of differential treatment – an understanding that has been used in the United States to subvert affirmative action. In India, by contrast, the Constitution's so-called Directive Principles of State Policy (a nonenforceable section of the Constitution) devotes a great deal of attention to promoting economic equality, and the Fundamental Rights are themselves specified in a way that makes room for affirmative-action programs designed to advance the material situation of women and the lower castes.

Thus, Article 15 states that "Nothing in this article shall prevent the State from

making any special provision for women and children,” and that “Nothing in this article . . . shall prevent the State from making any special provision for the advancement of any socially and educationally backward classes of citizens or for the Scheduled Castes and the Scheduled Tribes.” Similar clauses appear in Article 16 (equality of opportunity in public employment) and in Article 19 (various other rights and liberties). Even before independence, quotas and other affirmative-action measures for deprived groups were an accepted part of the Indian scene, and they became even more salient at independence. In short, the framers understood the goal of equality in terms of an end to systematic hierarchy and discrimination based on both caste and sex.

In light of this tradition it is not surprising that India has long been a center of thought and planning about sex equality, or that, when the United Nations Development Programme needed a major report on gender and governance, it turned the writing of this report over to its New Delhi office.⁵

There is one great structural difference between the Indian legal system and the Anglo-American systems to which it is related: India has no uniform code of civil law (even within each region). Criminal law is uniform for the nation as a whole and is administered by the state. But with the exception of commercial law, which was uniformly codified for the nation as a whole by the British and has remained so, civil law remains the province of the various religious systems of law – Hindu, Muslim, Parsi, and Christian. These systems are

5 This report will be published shortly; its authors include citizens of India, Sri Lanka, and the United States. (I wrote the introduction and the discussion of issues of sex equality within the family.)

defined by laws passed in Parliament, but they assign to religious bodies considerable power in the areas of marriage, divorce, child custody, and property. There are some individual secular laws of property, marriage, and divorce, but they do not form a system, and, because one is typically classified into a religious system at birth, it is not so easy for individuals to disengage themselves, particularly when property is jointly owned in family consortia (as it often is) from which individuals may not extricate their shares. These systems of personal law have made it uniquely difficult to end discrimination based on caste and sex.⁶ To explore these difficulties, however, would take us rather far from our primary topic.

Unlike the United States, India is an extremely poor nation. It ranks 115th out of the 162 nations of the world on the Human Development Index of the 2001 *Human Development Report*. The average life expectancy at birth is 62.9 (as opposed to 80.8 in Japan, 76.8 in the United States, and somewhere between these two numbers in Canada and most of Europe⁷), and infant mortality is high, at 70 for 1,000 live births (although this represents a great decline from 165 in 1960).

Women do even worse than men in basic nutrition and health. If equal nutrition and health were present, it is

6 See my discussion in *Women and Human Development: The Capabilities Approach* (New York: Cambridge University Press, 2000), chap. 3.

7 Ireland and Denmark are the only nations in Western Europe to have lower life expectancy than the United States, although most of the nations of Eastern Europe and the former Soviet Union also have lower expectancy. Also ahead of the United States are Australia, New Zealand, Israel, Hong Kong, Cyprus, Singapore, and Malta; Costa Rica and Barbados are close (76.2 and 76.6, respectively).

estimated that the sex ratio would be approximately 103 women to 100 men. India's sex ratio has not been even 1:1 at any time since measurements began in the early twentieth century. From a high of 97 women to 100 men in 1901, the ratio dropped steadily, reaching a low of around 93:100 in 1971; after a slight rise, it declined again even further, reaching 92.7:100 in 1991. These are official figures. Things are probably much worse, at least in some regions. A house-to-house count by a good NGO in rural Bihar arrived at a ratio of 75:100, and a similar count in a region of Karnataka found 65:100. Some of these differences should be attributed to the differential nutrition of boys and girls and to unequal health care, but sex-selective abortion and active infanticide are playing an increasing role. A recent study by the Indian Association of Women's Studies estimates that 10,000 female fetuses are aborted every year. Some regions tell a very different story: Kerala, for example, has more women than men. (This situation results from a combination of relatively female-friendly traditions and gender-friendly state governance.) But clearly, on the whole, women face special obstacles in India.

In education, the male-female gap is even more striking: the adult literacy rate for women is 44.5 percent, as against 67.8 percent for men. (In China, the figures are 75.5 percent for women and 91.2 percent for men.) Such statistics are hard to interpret, since local governments tend to be boastful and since it is hard to establish a clear measure of literacy. Yet what is unambiguously clear is that, despite the fact that education is a state responsibility, India has done very badly in basic education across the board, and even worse in basic education for women. Although all Indian states have laws making primary educa-

tion compulsory, these laws have little relation to reality. Many regions utterly lack schools of any kind, just as they frequently lack reliable electricity, medical services, water, and decent roads; many local functionaries are corrupt, and so teachers in many regions take pay without ever even showing up in the region where they are supposed to be teaching. In some rural areas, female literacy is as low as 5 percent. The national government, though well-intentioned, has done little to fill these gaps, although some adult education programs have been established in some of the poorer states, and many nongovernmental organizations run both adult education programs and after-work programs for working girls.

Still, this does not seem to be a necessary or unbreakable pattern, since some otherwise poor regions have done extremely well. Kerala has adult literacy of 90 percent and near-universal literacy among adolescent boys and girls. This remarkable record is the outcome of more than a hundred years of concerted public action. Recently a constitutional amendment was introduced that would make the right to education a justiciable fundamental right in India.⁸ It may be hoped that the passage of this amendment will goad government into acting more aggressively on its good intentions.

Among the greatest obstacles to fully equal citizenship that women face, in all nations, is their unequal exposure to sex-based violence.⁹ In India the problem of

8 Amendment 83, to be inserted in the Fundamental Rights section of the Constitution as Article 21a. See the full text of the amendment in *From the Lawyers Collective* 13 (April 1998): 10.

9 For data on the United States, and the failure of law to deal adequately with these problems, see chap. 5 of my *Sex and Social Justice* (New York: Oxford University Press, 1999).

violence against women is compounded, often, by the low age of marriage and the lack of economic options for a woman with little or no education. The marriage of girls as young as four or six, although long since illegal, is a common reality, especially in some regions where it is traditional. Laws against it are not enforced, and it shapes a girl's life from birth, often discouraging her family from educating her.

Within marriage, at all ages, domestic violence is so pervasive that three states have adopted alcohol prohibition laws in response to women's lobbying in an effort to reduce such violence. Police do not aggressively investigate domestic abuse, and virtually no women's shelters exist. Rape within marriage is not even illegal. Thus, women who wish to protect themselves against marital violence have few options. If they are not equipped for employment outside the home, they have virtually no exit options; many women endure lives of abuse because they know that prostitution is their only alternative.

The problem of domestic violence is being addressed, above all, through education, credit, and economic options. Hundreds of nongovernmental organizations, from the large Self-Employed Women's Association (SEWA), with over fifty thousand members, to the small village-based women's collective led by Poonam Devi, have been educating girls and women outside the formal state structure, lending them money, and teaching them employment-related skills so that they can do something on their own if they decide to leave a bad marriage. Education, credit, and the reform of antiquated property laws to give women land rights in their own names are probably the three most significant strategies against domestic violence. At the same time, most local

women's groups also address domestic violence directly, and politicians such as Poonam Devi fight to make life a bit fairer for widows and single women, two groups that suffer greatly from discrimination and vulnerability to violence.

Rape, however – in India as in so many other nations – has been badly dealt with under the law for many years, and the number of rapes appears to be on the rise. It is easy to find cases in which acquittal was secured on the grounds that the woman was of low caste, or “immodest,” even when there is ample evidence of forcible rape in the particular instance. Rape is also used as a weapon against women crusading for political change. In 1993 Bhanwari Devi, a member of the state of Rajasthan's Sathin movement for women's welfare, was campaigning against child marriage when she was gang-raped by men from a community that supports the practice of child marriage. Because the men were influential community leaders, police refused to register the case until it was too late to perform the necessary medical examination; a lower court in Jaipur acquitted all the accused. Although Bhanwari appealed this judgment and the Rajasthan High Court agreed in 1996 to hear her appeal, arguments in the case have not yet been heard.

In general, delays in the criminal justice system often create a lapse of ten years between rape and court date, making it very difficult for women to pursue their cases, even when they want to. Often they don't want to, because a woman's sexual history is still admitted as evidence, and assumptions about the woman's behavior and dress continue to influence the resolution of rape trials. Defendants can usually win a continuance on the flimsiest of pretexts, and their strategy typically is to delay and delay until the woman gives up the pros-

ecution. A friend of mine who is a professor of philosophy and women's studies at University of Lucknow urged a former student to pursue her rape complaint and promised to join her in court whenever the case surfaced – until, after five years, the woman had remarried, and didn't want to think about her rape any longer.

One case that spurred awareness of women's grievances in this area was the 1979 case of Mathura, a sixteen-year-old tribal woman who was raped by two policemen within a police compound. The lower court acquitted the policemen on the grounds that Mathura had eloped with her boyfriend and hence was "habituated to sexual intercourse"; they thus reasoned that she could not be an unconsenting victim – therefore she was not, technically, raped. The High Court overturned the decision, holding that mere passive surrender under threat cannot be counted as consent to intercourse. The Supreme Court, however, reinstated the lower court decision.

This judgment triggered widespread public protest and publicity; rape and rape law were discussed widely and openly for the first time. Four Delhi University law professors wrote a petition to the Supreme Court calling for a rehearing of the case. The petition, unfortunately, was dismissed. It did, however, energize the women's movement to demand legal change. More important, a law commission was set up by the government to consider changes in rape law.

One significant result was a shift in the burden of proof in custodial rape cases, as well as a set of mandatory minimum sentences for rape. Other feminist demands, such as the demand that a woman's prior sexual history should not be deemed relevant evidence, were not included in the version of the new legislation that was passed in 1982.

Recently, however, the Supreme Court, at least, has shown greater sensitivity to the issue of sexual violence. Hanuffa Khatoon's case shows a determination to confront the problem head-on, using the resources of the constitutional tradition, which has already held that the right to life guaranteed in Article 21 includes a right to life with human dignity. (The landmark case was one defending the rights of the homeless.) In an earlier case not centrally dealing with rape, the Court had already opined that rape is a constitutional issue, and they quoted from that case at the outset of their opinion in Hanuffa Khatoon's case, declaring that rape is a "crime against the entire society" because it "destroys the entire psychology of a woman." It is therefore a "crime against basic human rights" and a violation of the right to life with dignity guaranteed under Article 21. This judgment the justices then applied to Ms. Khatoon's gang rape by the railway employees. The justices argued, moreover, that the fundamental right to life with dignity belongs not only to citizens of India, but to all "persons" (like the Bangladeshi visitor Ms. Khatoon) within the territory of India.

Then, in a most interesting discussion, the courts pointed out that the Fundamental Rights are closely modeled on the list of rights in the UN's Universal Declaration of Human Rights. They mention particularly the declaration's emphasis on equal human dignity (Article 1); the right to life, liberty, and security of person (Article 3); the prohibition of "cruel, inhuman or degrading treatment" (Article 5); the guarantee of nondiscrimination and the equal protection of the laws (Article 7); and the prohibition of arbitrary detention (Article 9). They argue that the purpose of the section on Fundamental Rights in the Indian Constitution was to enact the

Universal Declaration and “to safeguard the basic human rights from the vicissitudes of political controversy. . . .” This being so, the meaning of the word “life” in the Indian Constitution can be further interpreted with reference to the declaration. They note that earlier Supreme Court decisions have already given “life” a broad construction, including the idea of life with human dignity. Since gang rape is obviously inconsistent with human dignity, and the rape was committed by government employees, the judgment of the Calcutta High Court awarding Ms. Khatoun damages from the Railways Board was upheld.

This creative judgment shows how a legal tradition can be fruitfully mined to give women redress against violence. Thus far, it has a function similar to that of the U.S. Violence Against Women Act, passed by Congress in 1994, which offered victims of sex crimes a federal avenue of redress, given the evident unevenness and unreliability of the criminal justice system in the states.¹⁰ (Of course, our Supreme Court, moving in the opposite direction from its Indian counterpart, has declared the 1994 Violence Against Women Act unconstitutional on the grounds that it allegedly exceeds the power of Congress.¹¹) But the Indian Supreme Court’s judgment shows something more: it shows that a national legal tradition may deepen and strengthen its fundamental rights through incorporation of the rights guaranteed in the international documents it has ratified.

This move has been made before in

10 On this issue see Stephen J. Schulhofer, *Unwanted Sex: The Culture of Intimidation and the Failure of Law* (Cambridge, Mass.: Harvard University Press, 1998).

11 *U.S. v. Morrison*, 120 S. Ct. 1740 (2000).

India. In another significant judgment concerning sexual harassment, the Supreme Court ruled that the guidelines on harassment in the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) are binding on the nation through its ratification of that treaty.¹² In this way the universal human rights guaranteed in treaties may enter a nation without violation of its democratic sovereignty and after due deliberation by the body that has been entrusted with the interpretation of fundamental rights.

In short, when a nation understands itself to be a member of the world community, committed to taking its treaty obligations seriously, creative legal change may ensue. Unfortunately, the United States is currently reverting to old isolationist habits, giving the impression that it does not need to consult with any other nation and that it is powerful enough to show disdain for the world community.

The surprising candidacy of Poonam Devi also is the fruit of creative constitutional thinking. At the time of India’s founding, in keeping with the generally substantive understanding of equality in its Constitution, various schemes of affirmative action on behalf of traditionally subordinated groups were contemplated. The Constitution created a system of representation meant to reflect the proportion of every caste and tribe in the total population of each state. The system works by a complex scheme of rotations: in successive elections, only members of certain groups may run for office, although all citizens

12 *Vishaka v. State of Rajasthan*, AIR 1997, 6 SCC 241. Compare the invocation of CEDAW as binding on the nation in a nationality case in Botswana: *Attorney General v. Unity Dow*, 1992 LRC (Cons) 623 (July 2, 1992).

may vote. Despite controversy and many complaints, the system seems to have worked reasonably well, effectively enfranchising a variety of previously disadvantaged groups and promoting their economic and social well-being. There is little doubt that it would have been difficult to achieve progress against the deeply entrenched realities of caste without such affirmative legal measures.

On the other hand, legitimate objections can be made to the system. First of all, no reserved seats have ever been created or even seriously championed for Muslims, arguably as vulnerable a minority as the Scheduled Castes and Tribes. Second, the practice of reservation has led over time to a situation in which castes at the very bottom of the social ladder do considerably better than those just above them. Thus, more recently, as a result of the 1980 report of the Mandal Commission, reservations for OBCs (Other Backward Castes) were added to the list. (Estimates of the proportion of India's population that belongs to OBC groups range from 25 percent to 37 percent, and many of these people are economically advantaged. Thus it can now be argued that the system of reservations no longer protects the most vulnerable and otherwise unrepresented groups.) As a result of the system of representation, a politics of caste has to some extent displaced a politics of national issues, and recent governmental instability at both regional and national levels can be partially attributed to the proliferation of caste-based parties. Despite these problems, however, the quota system seems to most Indians to be a source of more good than harm, and there is no serious demand for its abolition.

Reserved seats for women have been discussed since before independence. Early feminists opposed reservations,

arguing that they would compromise the struggle for women's full equality. At independence, accordingly, reservations for women were rejected, although, as noted above, affirmative action on the basis of sex won general support in the Constitution. In 1971, the government appointed a Committee on the Status of Women in India to study the progress that had been made by women since independence. In its famous 1974 report *Towards Equality*, the committee delivered a scathing critique of the political process, arguing that the political position of women in India had, if anything, worsened since 1950, and that women were neither able to claim their legal rights nor, in many cases, even aware of them. The majority of the committee continued to oppose reserved seats as a remedy, but a minority report signed by some especially prominent feminist leaders argued that this remedy was necessary for the resumption of social and political progress for women.

A generation later, the representation of women in central and state government continues to be very low: 6–7 percent in the Lok Sabha (the analogue of the House of Commons), one of the lowest parliamentary figures in the world. Political parties have talked about reserving a certain proportion of their own candidacies for women, but have done nothing about it. At the same time, women's voter turnout has significantly increased and is now at 55 percent, only slightly less than the national average. In this situation, it is not surprising that the idea of reserved legislative seats for women has attracted new political and constitutional attention, in connection with a push for greater local self-rule.

Arguing, like John Stuart Mill, that participation in local politics teaches citizens how to appreciate the common good, national legislators successfully

amended the Constitution in 1992 to give formal legal status to the system of *panchayats*, or local village councils, an aspect of governance central to Gandhi's vision of India but never fully implemented. The Amendments established a 33 percent quota for women in the *panchayats* and set up a system of rotation that is similar to that by which reservations for lower castes have already been implemented at the national level.

Initially, advocates for women were split about the merits of this system. Many feared that the women who would be selected would simply be tools of male interests. But nearly ten years of experience with the plan has shown that, on balance, its merits outweigh its drawbacks. Certainly in some cases women do initially function as proxies for the powerful men in their families. Poonam Devi was initially groomed for office by her husband, who believed that he would be unable to run for the seat. But even such women learn political skills in the process. Poonam Devi became so interested in politics that she is now running for office *against* the wishes of her husband. Whether she wins or loses, she is gaining valuable experience; if she loses, in due course she will be able to run for a reserved seat.

Moreover, the new system's extension of political power to poor and illiterate women has been dramatic. Studies show that a majority of women who serve in the *panchayats* are illiterate or barely literate. Moreover, approximately 40 percent of female representatives come from families with income below the poverty line. Women report many obstacles to their effective participation, including harassment and the threat of violence. Nonetheless, a number of women are evidently learning political skills and participating in decision-making in a way that would not have

been possible without the Amendments. In addition, the system has increased demands for female education: mothers can now urge their daughters to go to school in order to prepare themselves for a role in politics. They report that this gives them more power in the family to decide which children shall go to school.¹³

More recently, proposals to introduce reservations for women at the national level have encountered tremendous opposition – largely from lower-caste parties, who fear that the new quotas would result in fewer lower-caste legislators, since they believe that educated women will be the most likely to be elected. They propose a subquota in the general women's quota for lower-caste women, but so far proponents of the Amendment have rejected this proposal. Certainly such a quota for lower-caste women would exacerbate some of the problems already produced by caste-based reserved seats at the national level. A possible outcome of the current debate is that parties will agree to reserve a certain proportion of their tickets for female candidates (as they do in France and quite a few other countries).

It is ironic – and telling – that similarly creative proposals are non-starters in the United States. Even though the United States has one of the lowest proportions of women in the national legislature within the developed world, we are not looking around with genuine curiosity to see what other nations have done about

¹³ On all these matters, see Nirmala Buch, *From Oppression to Assertion: A Study of Panchayats and Women in Madhya Pradesh, Rajasthan and Uttar Pradesh* (New Delhi: Centre for Women's Development Studies, 1999); I am also grateful to Zoya Hasan and to Niraja Gopal Jayal for allowing me to read unpublished works on this topic, and for discussion.

this problem.

This is not to say that the Indian solution fits the U.S. situation. Very likely it does not. Quotas for women in the *panchayats* are a solution well adapted to the situation of the rural poor in India, where illiteracy and lack of employment outside the home pose daunting obstacles to women's political participation. In the United States, by contrast, many more women already work – and no real equivalent of India's *panchayats* exists.

Still, Indian politicians and jurists are *thinking* – as ours have too often refused to think – creatively. We should more vigorously confront the problem of violence against women and the problem of the underrepresentation of women in politics by considering a wide range of remedies – first on the list being campaign finance reform, which has at least received a hearing. But systems of multi-

ple voting and proportional representation, which have been used successfully by some municipalities for years to enfranchise underrepresented groups, should also be considered. In general, we should attend to the issue, debate it without phobic reactions (such as the term “affirmative action” so often evokes), and learn from other nations.

Both of these issues show us one large fact: the world is moving on, with or without U.S. participation, to find creative solutions to pressing problems of human inequality. Usually U.S. citizens don't know anything much about these developments, and some of our politicians encourage disdain for what is happening elsewhere. We need to learn new habits of curiosity and respect if we are to be productive members of an increasingly interdependent global community.

Note by
Frank
Wilczek

All too often, we ignore goals, genres, or values, or we assume that they are so apparent that we do not bother to highlight them. Yet judgments about whether an exercise – a paper, a project, an essay response on an examination – has been done intelligently or stupidly are often difficult for students to fathom. And since these evaluations are not well understood, few if any lessons can be drawn from them. Laying out the criteria by which judgments of quality are made may not suffice in itself to improve quality, but in the absence of such clarification, we have little reason to expect our students to go about their work intelligently.

Frank Wilczek

*on the
world's
numerical
recipe*

Twentieth-century physics began around 600 B.C. when Pythagoras of Samos proclaimed an awesome vision.

By studying the notes sounded by plucked strings, Pythagoras discovered that the human perception of harmony is connected to numerical ratios. He examined strings made of the same material, having the same thickness, and under the same tension, but of different lengths. Under these conditions, he found that the notes sound harmonious precisely when the ratio of the lengths of string can be expressed in small whole numbers. For example, the length ratio

Frank Wilczek, Herman Feshbach Professor of Physics at MIT, is known, among other things, for the discovery of asymptotic freedom, the development of quantum chromodynamics, the invention of axions, and the discovery and exploitation of new forms of quantum statistics (anyons). When only twenty-one years old and a graduate student at Princeton University, he and David Gross defined the properties of gluons, which hold atomic nuclei together. He has been a Fellow of the American Academy since 1993.

2:1 sounds a musical octave, 3:2 a musical fifth, and 4:3 a musical fourth.

The vision inspired by this discovery is summed up in the maxim “All Things are Number.” This became the credo of the Pythagorean Brotherhood, a mixed-sex society that combined elements of an archaic religious cult and a modern scientific academy.

The Brotherhood was responsible for many fine discoveries, all of which it attributed to Pythagoras. Perhaps the most celebrated and profound is the Pythagorean Theorem. This theorem remains a staple of introductory geometry courses. It is also the point of departure for the Riemann-Einstein theories of curved space and gravity.

Unfortunately, this very theorem undermined the Brotherhood’s credo. Using the Pythagorean Theorem, it is not hard to prove that the ratio of the hypotenuse of an isosceles right triangle to either of its two shorter sides cannot be expressed in whole numbers. A member of the Brotherhood who revealed this dreadful secret drowned shortly afterwards, in suspicious circumstances. Today, when we say $\sqrt{2}$ is irrational, our language still reflects these ancient anxieties.

Still, the Pythagorean vision, broadly understood – and stripped of cultic, if not entirely of mystical, trappings – remained for centuries a touchstone for pioneers of mathematical science. Those working within this tradition did not insist on whole numbers, but continued to postulate that the deep structure of the physical world could be captured in purely conceptual constructions. Considerations of symmetry and abstract geometry were allowed to supplement simple numerics.

In the work of the German astronomer Johannes Kepler (1570–1630), this program reached a remarkable apotheosis –

only to unravel completely.

Students today still learn about Kepler’s three laws of planetary motion. But before formulating these celebrated laws, this great speculative thinker had announced another law – we can call it Kepler’s zeroth law – of which we hear much less, for the very good reason that it is entirely wrong. Yet it was his discovery of the zeroth law that fired Kepler’s enthusiasm for planetary astronomy, in particular for the Copernican system, and launched his extraordinary career. Kepler’s zeroth law concerns the relative size of the orbits of different planets. To formulate it, we must imagine that the planets are carried about on concentric spheres around the Sun. His law states that the successive planetary spheres are of such proportions that they can be inscribed within and circumscribed about the five Platonic solids. These five remarkable solids – tetrahedron, cube, octahedron, dodecahedron, icosahedron – have faces that are congruent equilateral polygons. The Pythagoreans studied them, Plato employed them in the speculative cosmology of the *Timaeus*, and Euclid climaxed his *Elements* with the first known proof that only five such regular polyhedra exist.

Kepler was enraptured by his discovery. He imagined that the spheres emitted music as they rotated, and he even speculated on the tunes. (This is the source of the phrase “music of the spheres.”) It was a beautiful realization of the Pythagorean ideal. Purely conceptual, yet sensually appealing, the zeroth law seemed a production worthy of a mathematically sophisticated Creator.

To his great credit as an honest man and – though the concept is anachronistic – as a scientist, Kepler did not wallow in mystic rapture, but actively strove to see whether his law accurately matched reality. He discovered that it does not. In

*The world’s
numerical
recipe*

wrestling with the precise observations of Tycho Brahe, Kepler was forced to give up circular in favor of elliptical orbits. He couldn't salvage the ideas that first inspired him.

After this, the Pythagorean vision went into a long, deep eclipse. In Newton's classical synthesis of motion and gravitation, there is no sense in which structure is governed by numerical or conceptual constructs. All is dynamics. Newton's laws inform us, given the positions, velocities, and masses of a system of gravitating bodies at one time, how they will move in the future. They do not fix a unique size or structure for the solar system. Indeed, recent discoveries of planetary systems around distant stars have revealed quite different patterns. The great developments of nineteenth-century physics, epitomized in Maxwell's equations of electrodynamics, brought many new phenomena within the scope of physics, but they did not alter this situation essentially. There is nothing in the equations of classical physics that can fix a definite scale of size, whether for planetary systems, atoms, or anything else. The world-system of classical physics is divided between initial conditions that can be assigned arbitrarily, and dynamical equations. In those equations, neither whole numbers nor any other purely conceptual elements play a distinguished role.

Quantum mechanics changed everything.

Emblematic of the new physics, and decisive historically, was Niels Bohr's atomic model of 1913. Though it applies in a vastly different domain, Bohr's model of the hydrogen atom bears an uncanny resemblance to Kepler's system of planetary spheres. The binding force is electrical rather than gravitational, the players are electrons orbiting around protons rather than planets orbiting the

Sun, and the size is a factor 10^{-22} smaller; but the leitmotif of Bohr's model is unmistakably "Things are Number."

Through Bohr's model, Kepler's idea that the orbits that occur in nature are precisely those that embody a conceptual ideal emerged from its embers, reborn like a phoenix, after three hundred years' quiescence. If anything, Bohr's model conforms more closely to the Pythagorean ideal than Kepler's, since its preferred orbits are defined by whole numbers rather than geometric constructions. Einstein responded with great empathy and enthusiasm, referring to Bohr's work as "the highest form of musicality in the sphere of thought."

Later work by Heisenberg and Schrödinger, which defined modern quantum mechanics, superseded Bohr's model. This account of subatomic matter is less tangible than Bohr's, but ultimately much richer. In the Heisenberg-Schrödinger theory, electrons are no longer particles moving in space, elements of reality that at a given time are "just there and not anywhere else." Rather, they define oscillatory, space-filling wave patterns always "here, there, and everywhere." Electron waves are attracted to a positively charged nucleus and can form localized standing wave patterns around it. The mathematics describing the vibratory patterns that define the states of atoms in quantum mechanics is identical to that which describes the resonance of musical instruments. The stable states of atoms correspond to pure tones. I think it's fair to say that the musicality Einstein praised in Bohr's model is, if anything, heightened in its progeny (though Einstein himself, notoriously, withheld his approval from the new quantum mechanics).

The big difference between nature's instruments and those of human con-

struction is that her designs depend not on craftsmanship refined by experience, but rather on the ruthlessly precise application of simple rules. Now if you browse through a textbook on atomic quantum mechanics, or look at atomic vibration patterns using modern visualization tools, “simple” might not be the word that leaps to mind. But it has a precise, objective meaning in this context. A theory is simpler the fewer nonconceptual elements, which must be taken from observation, enter into its construction. In this sense, Kepler’s zeroth law provided a simpler (as it turns out, too simple) theory of the solar system than Newton’s, because in Newton’s theory the relative sizes of planetary orbits must be taken from observation, whereas in Kepler’s they are determined conceptually.

From this perspective, modern atomic theory is extraordinarily simple. The Schrödinger equation, which governs electrons in atoms, contains just two nonconceptual quantities. These are the mass of the electron and the so-called fine-structure constant, denoted α , that specifies the overall strength of the electromagnetic interaction. By solving this one equation, finding the vibrations it supports, we make a concept-world that reproduces a tremendous wealth of real-world data, notably the accurately measured spectral lines of atoms that encode their inner structure. The marvelous theory of electrons and their interactions with light is called quantum electrodynamics, or QED.

In the initial modeling of atoms, the focus was on their accessible, outlying parts, the electron clouds. The nuclei of atoms, which contain most of their mass and all of their positive charge, were treated as so many tiny (but very heavy!) black boxes, buried in the core. There was no theory for the values of nuclear

masses or their other properties; these were simply taken from experiment. That pragmatic approach was extremely fruitful and to this day provides the working basis for practical applications of physics in chemistry, materials science, and biology. But it failed to provide a theory that was in our sense simple, and so it left the ultimate ambitions of a Pythagorean physics unfulfilled.

Starting in the early 1930s, with electrons under control, the frontier of fundamental physics moved inward, to the nuclei. This is not the occasion to recount the complex history of the heroic constructions and ingenious deductions that at last, after fifty years of strenuous international effort, fully exposed the secrets of this inaccessible domain. Fortunately, the answer is easier to describe, and it advances and consummates our theme.

The theory that governs atomic nuclei is quantum chromodynamics, or QCD. As its name hints, QCD is firmly based on quantum mechanics. Its mathematical basis is a direct generalization of QED, incorporating a more intricate structure supporting enhanced symmetry. Metaphorically, QCD stands to QED as an icosahedron stands to a triangle. The basic players in QCD are quarks and gluons. For constructing an accurate model of ordinary matter just two kinds of quarks, called up and down or simply u and d , need to be considered. (There are four other kinds, at least, but they are highly unstable and not important for ordinary matter.) Protons, neutrons, π mesons, and a vast zoo of very short-lived particles called resonances are constructed from these building blocks. The particles and resonances observed in the real world match the resonant wave patterns of quarks and gluons in the concept-world of QCD, much as states of atoms match the resonant wave pat-

*The world's
numerical
recipe*

terns of electrons. You can predict their masses and properties directly by solving the equations.

A peculiar feature of QCD, and a major reason why it was hard to discover, is that the quarks and gluons are never found in isolation, but always in complex associations. QCD actually predicts this “confinement” property, but that’s not easy to prove.

Considering how much it accounts for, QCD is an amazingly simple theory, in our objective sense. Its equations contain just three nonconceptual ingredients: the masses of the u and d quarks and the strong coupling constant α_s , analogous to the fine structure constant of QED, which specifies how powerfully quarks couple to gluons. The gluons are automatically massless.

Actually even three is an overestimate. The quark-gluon coupling varies with distance, so we can trade it in for a unit of distance. In other words, mutant QCDs with different values of α_s generate concept-worlds that behave identically, but use different-sized metersticks. Also, the masses of the u and d quarks turn out not to be very important, quantitatively. Most of the mass of strongly interacting particles is due to the pure energy of the moving quarks and gluons they contain, according to the converse of Einstein’s equation, $m = E/c^2$. The masses of the u and d quarks are much smaller than the masses of the protons and other particles that contain them.

Putting all this together, we arrive at a most remarkable conclusion. To the extent that we are willing to use the proton itself as a meterstick, and ignore the small corrections due to the u and d quark masses, QCD becomes a theory with *no nonconceptual elements whatsoever*.

Let me summarize. Starting with precisely four numerical ingredients, which must be taken from experiment, QED

and QCD cook up a concept-world of mathematical objects whose behavior matches, with remarkable accuracy, the behavior of real-world matter. These objects are vibratory wave patterns. Stable elements of reality – protons, atomic nuclei, atoms – correspond, not just metaphorically but with mathematical precision, to pure tones. Kepler would be pleased.

This tale continues in several directions. Given two more ingredients, Newton’s constant G_N and Fermi’s constant G_F , which parametrize the strength of gravity and of the weak interaction, respectively, we can expand our concept-world beyond ordinary matter to describe virtually all of astrophysics. There is a brilliant series of ideas involving unified field theories and supersymmetry that might allow us to get by with just five ingredients. (Once you’re down to so few, each further reduction marks an epoch.) These ideas will be tested decisively in coming years, especially as the Large Hadron Collider (LHC) at CERN, near Geneva, swings into operation around 2007.

On the other hand, if we attempt to do justice to the properties of many exotic, short-lived particles discovered at high-energy accelerators, things get much more complicated and unsatisfactory. We have to add pinches of many new ingredients to our recipe, until it may seem that rather than deriving a wealth of insight from a small investment of facts, we are doing just the opposite. That’s the state of our knowledge of fundamental physics today – simultaneously triumphant, exciting, and a mess.

The last word I leave to Einstein:

I would like to state a theorem which at present can not be based upon anything more than upon a faith in the simplicity, i.e., intelligibility, of nature: there are no

arbitrary constants . . . that is to say, nature is so constituted that it is possible logically to lay down such strongly determined laws that within these laws only rationally completely determined constants occur (not constants, therefore, whose numerical value could be changed without destroying the theory).

David G. Nathan

*on clinical
research
&
the future
of
medicine*

Biomedical inquiry as it is practiced in America today is an amalgam of three different kinds of research: basic research, population research, and clinical research. While all three are of critical importance, it is clinical research that underpins our national medical efforts. Only clinical researchers are able to apply the knowledge of the cell and organ systems developed by basic researchers, and the population data gathered by epidemiologists and biostatisticians, to patients, making this knowledge and data relevant to medical practice by “translating” it into novel

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