

# Evolution and Neo-Realism

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Neo-realists rely importantly on the assumption that a nation-state must either conduct a rational, self-interested foreign policy or face extinction. This assumed selection pressure accounts, in the neo-realist view, for the primacy of national-security interests in foreign policy and for the irrelevance of domestic politics to international relations. Nations must focus on survival in the international system—or perish. Those nations that remain will then be those, and only those, that can conduct a self-interested, security-oriented foreign policy.

The neo-realist's assumption is wrong on several grounds. *First*, the neo-realists' logical argument that *low* extinction rates are evidence of *high* selection pressures is patently fallacious. High extinction rates would be much more suggestive of high selection pressures. *Second*, the balance of the empirical evidence suggests that extinction rates of, and selection pressures on, nation-states are low. International relations is not an environment “red in tooth and claw” but rather a lush setting highly amenable to the birth and propagation of nation-states. For at least the past century, many more nation-states have been created than have perished—the precise opposite of the situation that one would expect if the Malthusian pressures implicit in the neo-realist view actually operated. Additionally, many nation-states have successfully traversed the

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supposed knife-edge of international politics for hundreds of years. *Third*, in the past two centuries, the vast majority of failed nation-states perished during one of three waves of mass extinctions, with the vast majority of new nation-states arising shortly thereafter. Such a dynamic, which evolutionary biologists characterize as a “punctuated equilibrium,” implies that the extinction of nation-states is a matter of chance, not of poor foreign policy.

After a brief introduction to evolutionary theory in biology and to neo-realist arguments about international relations, the first three sections of the paper take up each of the difficulties with the neo-realist position described above: fallacious inference from low extinction rates, ignorance of evidence plainly contrary to the neo-realists’ assumptions, and the existence of a punctuated equilibrium. A fourth section leaves behind criticism and, taking for granted that the neo-realist position is at least potentially salvageable, generates and evaluates several possible analogies between biological evolution and international relations.

## Introduction I: A Lightning Tour of Evolutionary Theory in Biology

Biological evolution means different things to different people, but there are a number of core concepts upon which biologists are quite likely to agree. Biological evolution involves the natural selection of variable, heritable traits in living organisms. A *species* consists of organisms of “interbreeding natural populations that are reproductively isolated from other such groups.” (Mayr 1963) Each organism has a complement of genes, which control the synthesis of proteins crucial to the organism’s metabolism, and thus to its expressed characteristics. Individuals within a species display variation in their expressed traits, based in part on variation in the genetic complements of different individuals. (The environment also contributes to observed variation, as when changes in food supply change the adult size of an organism.) The origin of those genetic variations involves random mutations in the chromosomes that contain genes.

Absent mutations, the genetic complement of an organism is passed to its offspring (in whole or in part or in whole multiples, depending upon the mode of reproduction).

A gene that confers a significant selective advantage to an individual—through the gene’s contribution to an adaptively useful blood type, for example—cannot directly and independently reproduce. (I exclude viruses and virus-like organisms, which lack a semi-permanent host for their genetic complement, from the discussion.) Instead, an organism carrying that gene, and carrying many other genes in its complement of nuclear DNA, survives to reproduce.

Populations of organisms evolve with changes in the relative frequency in the population of the genes carried by individuals. Natural selection favors reproduction by organisms that in the aggregate display traits enhancing their survival. Such traits, if the result of heritable factors, will become more frequent in the population of a given organism over time.

A summary of these phenomena is relatively straightforward. Genes mutate. Genes (partially) control an organism’s traits. Natural selection favors certain traits. Individuals possessing on balance a set of favorable traits will reproduce more quickly or more numerously than individuals possessing on balance a set of selectively disfavored traits. Reproducing organisms pass some or all of their genetic complement to their offspring. Populations will then evolve as, over time, the genes expressing favored traits increase in frequency in the population of the species as a whole.

Most descriptions of biological evolution assign an especially prominent role to natural selection as a causal mechanism. Indeed, some biologists *define* evolution as the product of selective pressures (acting upon a pool of randomly determined, heritable variations. The well-known phrase “survival of the fittest,” which implies survival *only* of the fittest, serves as a compression of the idea that organisms (or, in non-biological realms, whatever subject is under analysis) consistently face strong selection pressures.

## Introduction II: Classical Realism, Neo-Realism, and Selection

To the classical realist, international politics is an endless succession of armed conflicts because of an ineluctable human tendency towards aggression or because of the predictable ambitions of rulers who, after all, must desire or exercise power to become the leader of a nation. Balance-of-power politics follows naturally from the interaction of the strong, who are eager to seize any opportunities for conquest or coercion that may arise, and the weak, who are more or less forced to band together to avoid utter subjugation. The world of the classical realist is the world of Hobbes, writ large and from the national perspective perhaps not so short, but nasty and brutish to be sure.

Neo-realists place a rational-choice gloss upon the primal explanations of the classical realists. Nation-states are assumed to be rational, unitary actors. They operate in an anarchical environment, where “anarchy” is not exactly chaos but rather an “organizing principle” characterized by a system where the units of interaction are roughly co-equal and where no overarching authority exerts a remotely reliable coercive power over the units of interaction. In a world of anarchy, self-help is the predominant tool of the nation-state. In a world in which nation-states are capable of doing harm to one another with military force, and in which intentions are difficult to discern, then a nation must undertake self-help with ceaseless vigilance—not only because the threat from even the most apparently benign of neighbors remains and because extinction is always nigh, but also because security is a relative matter. One nation’s attainment of security through a relative advantage leads to insecurity in others; the insecure nations will, perhaps by banding together, strive to relieve their insecurity by improving their position relative to the originally secure nation; the originally secure nation will then see its security erode and react by attempting to improve its position ... and so it goes. The world of the neo-realist is the commercial marketplace of the neo-classical economist, though one in which nations play the part of firms and national security substitutes for market share.

The possibility of involuntary exit—state death—plays a crucial role in the neo-realist tale, just as the shadow of bankruptcy looms over every business in the competitive market of the neo-classical economist. Neo-realists are at pains to point out that, in contrast to issues of international trade or other examples of “low” politics, the “high” politics of security issues have as their stakes the very survival of a nation-state. Few states, they argue, collapse as a result of excessively high tariffs, while many states have disappeared after choosing the wrong neighbor to anger or choosing what proves to be a weak partner in an alliance.

This ever-present possibility of being hanged in the morning, or at least the near future, concentrates the national mind wonderfully. Selection pressure in the international system is high. Domestic politics are at most a distraction. If a state’s foreign policy privileges domestic political preferences over geopolitical necessities, then the nation-state will fall to foreign invasion. If a nation-state’s foreign policy focuses on trade or environment to the detriment of security issues, then the nation-state will pay dearly for its inattention. Only a security threat is likely, so the argument goes, to erase the nation-state itself, and so security issues must take primacy over issues that do not threaten the *sine qua non*. Even security issues require not just rationality but rational egoism, lest a nation mortgage its future to the goodwill of some other nation that chooses not to keep its own promises. Nations cannot depend on the kindness of foreigners. Over time, then, only those nation-states that pay sufficient attention, and sufficiently selfish attention, to security issues in making their foreign policy will survive. The selection pressure created by other nations will select out inattentive and altruistic states from the system.

Indeed, the winnowing process may cull more than just the domestically distracted, the internationally inattentive, or the insufficiently egoistic from the international system. Some nation-states may try to conduct a wise and attentive foreign policy, but fail. Good intentions are no proof against cold steel. Attentive but inept nations will also be selected out of the international system.

The survivors among nation-states, then, will be those who have succeeded in conducting a wise and well-focused foreign policy. Even if the pool of nation-states initially contains many irrational or inept states, the set of nation-states will eventually consist only of rational, self-interested states. The rational geopolitical egoist will conquer all others. Only the fittest will survive. The *assumption* of rational, unitary, self-interested nations can with little effort become a *conclusion* drawn by the neo-realist from the asserted dynamics of the international system.

## I. The Illogic of Neo-Realism's Treatment of State Extinction

Traditionally, as described above, the neo-realists have maintained as a logical matter that the strong selection pressures inherent in an anarchical international system, comprised as it assumedly is of well-armed states at least partly opaque to their neighbors, will lead to rational geopolitical egoism among those states hardy enough to survive. Traditionally, the neo-realists have faced a fact that one might imagine undercuts this perspective: state extinction is rare.

Manfully, the neo-realists argue that the rarity of state extinction supports their argument. In a world in which selection pressures in favor of rational, egoistic, security-oriented states have existed for hundreds of years, the neo-realists argue, one should in fact expect to see low current rates of state extinction. In this view, the unfit nations have *already* been selected out. Extant nations have survived centuries of earlier struggle and, gimlet-eyed and geopolitically savvy, should continue to have survived in high numbers in the more recent past. Analogously, post-Cretaceous reptilian predators like the alligator have survived through the millenia, subject to strong selection pressures all along, and so one would predict that the modern alligator would in fact be hardy. Primitive, perhaps, but nonetheless robustly successful.

One cannot gainsay the logic of this argument, taken on its own: in an environment characterized by long periods of strong selection pressure from a constant and ongoing source, the current inhabitants of that environment are likely to be well suited to their environs and thus unlikely to go extinct.

There are, however, two problems with this argument as the neo-realists make it. Perhaps the most glaring difficulty is what this argument does not note: in an environment characterized by long periods of *no* selection pressure from any source, the current inhabitants of that environment are *also* unlikely to go extinct. With no selection pressure, entities of all stripes will survive. The absence of pervasive state deaths is, therefore, consistent with both the neo-realist position *and* its precise opposite. The *presence* of pervasive state death would be inconsistent with the neo-realist argument that states are well suited for their environment as a result of a long period of high selection pressure, but the *absence* of pervasive state death is consistent with either the presence of highly fit organisms or the absence of selection pressures.

(This paper generally ignores a double counterfactual that nonetheless may occur to readers familiar with the inductive nature of much theorizing in international relations: if international relations displayed a *high* rate of state extinction, wouldn't the neo-realists delightedly point to the operation of strong selection pressures in the international environment? Such a position would, to be logically consistent, require denouncing any argument that *low* extinction rates show high selection pressures, since this neo-neo-realist argument holds that *high* extinction rates show high selection pressures. If the current neo-realist argument and the neo-neo-realist argument existed side by side in the relevant portion of IR theory, then proponents of this inclusive theory would be asserting that *any* rate of state deaths supported its position, which seems a flaw in any theory that aspires to generate empirically testable propositions. This paper, however, simply takes at face value the current neo-realist assertion that (only) low extinction rates in the current international environment are consistent with the once and current presence of strong selection pressures.)

The neo-realist argument that low rates of state deaths affirm the adaptive fitness of modern states is therefore logically underdetermined: in fact, low extinction rates are consistent not only with high adaptive fitness among contemporary states (owing to high selection pressure in the past) but also with low selection pressures. This is not the only logical difficulty with the neo-realist argument, however. If the neo-realists wish to argue that low contemporaneous extinction rates are consistent with the prior existence of strong selection pressures, they must also argue that *exactly the same* selection pressures that existed in the past exist in the present. If selection pressures are both strong and consistent through time, then entities present after the passage of significant amounts of time will be highly fit for their environments and thus unlikely to suffer extinction. Strong selection pressures in the past will have weeded out the unfit, while those strong selection pressures in the present will not harm those organisms still alive. If selection pressure is strong but from *variegated* sources, however, then the previously fit inhabitants of the environment will be *poorly* adapted to the new environment and will perish in large numbers.

A well-known example from recent natural history may illustrate. In northern England, the Manchester moth spends a great deal of time in the presence of both birch trees and predatory birds. The bark of the birch tree is white in a state of nature. The population of the Manchester moth, as of the onset of the Industrial Revolution, was almost entirely white. Inferentially, the prevalence of this coloration was a result of strong selection pressure against highly visible, dark-colored moths—easy prey for watchful, hungry avians. A small number of darkly colored members of the species survived, however. Soot from the smokestacks of the factories of the Industrial Revolution in northern England blackened the bark of the birch trees. The moths and their predators remained. In much less than a century—the geological blink of an eye—the moth population was almost entirely dark-colored. Inferentially, the few dark-colored moths present in the population at the onset of the Industrial Revolution were more difficult for predators to find on sooty trees than were light-colored moths, and so those moths born dark were much more likely to survive to pass on their genes for dark coloration to their offspring than those moths born white were to survive to pass on the



light-coloration genes to their progeny. Over time, selection pressures operated to swing the balance of coloration in the moth population from light to dark—even though the initial predominance of light-colored moths was presumably due to the operation over long periods of time of strong selection pressures.

Indeed, this story has another turn, and one that also emphasizes the transience of fitness in at least some circumstances. Light-colored Manchester moths have in the recent past been the unintended beneficiaries of successful human efforts to reduce industrial air pollution. The skies of northern England are no longer so sooty as they once were, and the light-colored Manchester moths are seen with increasing frequency in the population. What once was a losing trait (dark coloration) became a winning trait, and then that winning trait in turn lost ground to a newly viable alternative. Changes in the observed frequency of moth coloration—the analogy to state death in the international system—were frequent during *both* the increase and the decrease in the Industrial Revolution’s air-borne offal.

Is the international system so much more constant than the soot output of Manchester’s factories? The question is far from merely rhetorical. Unless the international environment is constant, then the absence of state extinction is evidence only for a *lack* of selection pressures. The asserted fitness of extant states depends upon the criteria for their fitness having been constant over time. On one level, the neo-realist might well answer “yes” to this question of international constancy: the balancing of power and the need for states ceaselessly to struggle for relative security advantages are phenomena with a timeless quality about them, at least to the neo-realist. At any level of analysis below the most abstract, however, one’s intuition is likely to be that the characteristics allowing states successfully to navigate the Thirty Years War might not be the same characteristics allowing states to prosper in an age of nuclear weaponry and globalized economies. As the United States itself perhaps shows only too well, a nation may display indifferent statecraft of the traditional sort yet succeed mightily so long as it focuses on innovative technologies. Certainly a robust line of kingly successors and a warm relationship with mercenary troops and the upper hierarchy of the Christian sect

commanding the greatest allegiance of one's peasants has not, at least since Napoleon, remained the ticket to national success. To the degree that the fitness criteria in international relations have changed over time, the lack of state extinctions in the recent past is evidence only of a general lack of selection pressure rather than of state fitness fine-tuned over a long lapse of time.

## II. Empirical Evidence of State Transitions and Neo-Realism

A more directly empirical threat to the neo-realist argument would be evidence that state extinction is relatively frequent. (Again, however, perhaps the neo-realists will then abandon their fitness argument for a gleeful declaration that selection pressures are so strong that states die frequently). Fazal has argued that extinction, as defined by a significant foreign military occupation, has in fact befallen about 25% of nation-states, as defined in the Correlates of War Project, during the period from 1816 to the present. Fazal is careful to qualify her results, noting that state extinction has been virtually absent from the international system since 1945 and that buffer states make up an especially prominent portion of vanished states. Still, only nine of the twenty-three states extant in 1816 survived continuously to 1996.

Fazal presents strong evidence that, at least from 1816 until 1945, the birth of a state was not a guarantee of its perpetuity. Her definition of state extinction is a relatively broad one, however. By this measure, France perished during both the Franco-Prussian War and World War II, and, if it were in Fazal's sample set, would presumably have perished in 1814 or 1815 as well—yet of course we recognize "France" on the map as in continuous existence from well before 1814 until well after 1945. This is not merely an acknowledgment of a nation or a culture without attention to whether the nation or culture has a state. In contrast to, say, Laplanders, the French throughout this period had a state and not only a culture, a language, or a people. Tsarist Russia became, after a military occupation of much of its European territory, soon became the Soviet Union, and then after the Cold War became Russia again. Tsarist Russia perished under

Fazal's definition. So too did the Soviet Union, if only as the result of a somewhat ad hoc recognition by Fazal that not every state death requires a military occupation. Yet there is a clear continuity among all these entities: Russians were at the center of Tsarist Russia and the Soviet Union, even though both of these entities had imperial holdings outside of Russia, and Russians are now obviously at the core of the Russian Republic. One might also note that, even under Fazal's definition, three-quarters of all states did *not* fall victim to military occupations or other events defined by Fazal as state death. To the extent that Fazal's definition of state extinction overestimates the actual number of state deaths, the neo-realist argument remains unthreatened.

An examination not only of the death, but also of the birth, of states provides significant evidence consistent with a *lack* of selection pressure in the international system and thus inconsistent with the neo-realist argument.

Under the Correlates of War Project's definition of a nation-state, there were 23 states in 1816. As of 1997, there were 187. This nearly ten-fold increase in the number of states is hardly evidence for a ruthless winnowing of irrational or altruistic states. Certainly, on balance, the international system shows a surplus of state births over state deaths. While much of this growth in the number of nation-states followed World War II, the increase in extant states also shows a nearly secular trend over a much longer period of time. As mentioned, there were twenty-three nation-states in 1816 under the definition of state employed by the Correlates of War Project. In 1920, there were 42 charter members of the League of Nations, with 21 more joining in the next two decades. (This membership count ignores withdrawals or expulsions from the League.) After World War II, there were only 53 charter members of the United Nations—a slight drop compared to the minimum of 63 nations extant by the end of the League—but 67 more nations joined the UN in the next 17 years, and 50 more in the 17 years after that. Current UN membership totals nearly 200 states. The membership of an international organization is not a perfect representation of the number of states in the international system—Switzerland was plainly a state but only quite recently joined the United Nations—but no one would argue that there were dozens and dozens states at the start of

the 20<sup>th</sup> century that existed but simply eschewed membership in the League or the UN. Overall, then, many more nations were born and survive to this day than have perished.

One might contrast the nearly explosive net growth in the number of states with some common biological examples of theoretical fecundity that do not result in a concomitant increase in organisms surviving to reproduce. Bacteria, which propagate through simple fission, have a sufficiently short generation time under optimal conditions that a week of unrestrained growth from a single cell would produce enough organisms to fill a volume equivalent to that of the Earth. The cabbage aphid has an average of 41 offspring per female, with roughly sixteen generations per summer. One such insect, if all of its progeny were insulated from death, could produce about  $1.5 \times 10^{24}$  aphids in a summer. (Herrick) The originating aphid's offspring would outnumber the stars in the universe by several orders of magnitude. Even the ponderous reproductive processes of the elephant would, if an initial population of 10,000 animals grew at a mere 1% per year since the end of the last Ice Age, have resulted in a population of  $2 \times 10^{47}$  organisms by the present day. Such a pachyderm population would outweigh the Earth by roughly two dozen orders of magnitude. (Silverman website) Obviously, we do not observe populations of these sizes in nature. The gigantic deficit in available natural resources, compared to the potential needs of even one generation of offspring grown to adulthood, gives rise instead to strong selective pressure and to roughly steady populations. The population of states, in contrast, shows rapid growth unchecked by any selection pressures strong enough produce anything remotely resembling a steady-state population. The contrasting world of international relations—in which a state born since 1945 is almost certain to have survived to the present day and in which, since the Congress of Vienna, many more states have been born—seems an environment so comparatively benign as to be essentially devoid of any selection pressures at all.

### III. Punctuated Equilibria and State Extinction

In theories of evolutionary biology, two main perspectives on the rate of change in the number of extant species exist. The “gradualist” perspective, of longer standing in evolutionary biology, holds that the predominant force in determining whether species thrive or perish is a force operating gradually over long periods of time. The competing theory of “punctuated equilibrium,” associated with Neil Campbell and Stephen Jay Gould holds that very intense forces of selection operate for very brief periods of time (geologically speaking), with the intervening periods characterized by very mild selection pressures and concomitantly few extinctions.

The two perspectives are in the end matters of degree—both acknowledge that there have been mass extinctions during relatively short periods of time, and both acknowledge that selective fitness of one sort or another accounts for the survival of those species that persist through a mass extinction—but these matters of degree are not simply quibbles about a second-derivative function. To the gradualist, natural selection of a slow but discriminating type is the predominant mode of species selection. Species that survive do so as a result of the gradual accumulation of adaptive traits providing small comparative advantages compared to other species. To the backers of punctuated equilibrium, in contrast, the world as we see it is the result of a much more arbitrary process. Periodically, a catastrophe befalls the world. Huge numbers of species perish, possessing a wide variety of fine-tuned fitnesses that do not select carefully over long periods of adaptation for the very fittest species. Once having survived a catastrophe, a species does not exhibit much subsequent change. Selection pressures are gigantic and arbitrary at the punctuation, and minimal if still extant during the equilibria. If all of the dinosaurs perished despite the huge variations among them, then what impact did natural selection have upon all that accumulated variety of characteristics and fitnesses? If

mammals suffered a huge growth in numbers of species and differentiations among them in a relatively short time, and then changed little, then what impact does natural selection have during the millennia between catastrophes and upon their fitness to survive the next catastrophe?

The two theories appear conceptually an even match, with no obvious errors of logic or ambiguities of definition. The debate between those favoring gradualism and those endorsing punctuated equilibrium persists in evolutionary biology in significant measure because of the paucity of the kind of data necessary to resolve the issue. The fossil record, of course, is the pre-eminent source for data in debates involving geological time scales. That record has huge gaps in both space and time. Found fossils vary immensely in completeness and quality. Many important traits—coloration, locomotion, embryological characteristics—are almost impossible to determine even with the most modern methods and the most favorable fossil record.

Those who study international relations instead of evolutionary biology are fortunate to have before them a much less opaque and more complete record. At least if one confines one's analysis to the past few centuries, then the births and deaths of states are known almost exactly and all around the globe, absent a few definitional ambiguities. The record of these past few centuries is much more consistent with a theory of punctuated equilibrium, rather than of gradualism, with respect to states in international relations. There are two, or at most three, periods of mass extinction of states during the past few centuries. In between, the number of state deaths is minimal.

The extinction of the dinosaurs closely followed the impact of a huge meteorite near what is now the Yucatan Peninsula. In international relations, the meteorites were made in Berlin. The unification of non-Austrian initiated by Prussia, and the roughly contemporaneous unification of Italy, led to one period of mass state extinctions. The

attempted conquest of Europe initiated by Nazi Germany led to another such period. Depending upon one's definition of state extinction, the Napoleonic Wars constituted another such catastrophe for the existing constellation of states. (If one's definition of "state" includes the ruling structures of aboriginal peoples in Africa, Australia, and the Western Hemisphere, then European colonization is a fourth period of mass extinctions. This paper excludes this historical period from its analysis and thus need not reach this definitional question.)

Table One shows the exact distribution of state extinctions by year during the period 1816-1996. The clustering of extinctions around 1870 and 1940 is apparent. Of the 23 states extant in 1816, nine remained in (continuous) existence over the nine score years until 1997. Of those states that perished, nine died between 1860 and 1871, and four during World War II. The exception, Austria-Hungary, left the international system in 1918. [Note to readers of the draft: Austria-Hungary died after a mere 480 years of life under the Habsburgs. I would like in a future draft to examine state lifespan rather than simply the post-1816 occurrence of state deaths. Note, for example, that if states typically persist for a century before dying, no one year presents a very high chance of a state's extinction, and thus the selection pressures at any one time are pretty low.]

If we extend the record a decade further into the past than does the Correlates of War Project and thereby include the Napoleonic Wars within our analysis, then the possibility of a third mass extinction—again, one in Europe—arises. Under a military-occupation definition, no third period of mass extinction will arise: only a few states actually perished during the Napoleonic Wars. Instead, Napoleon's conquests typically led not to military occupation but to a peace treaty favorable to France, or to the installation of one of Napoleon's marshals or family members as ruler of the conquered state, or to both. Even these outcomes did not always follow Napoleon's triumphs. He thrashed Austria twice on its own territory and numerous times in Italy, and he soundly defeated the Prussians in 1806, but no military occupation—or installation of a relative of *l'empereur*—occurred in either case. Napoleon did, however, conquer and occupy several lesser German states, as well as Spain and the Netherlands. Sweden and a variety of Italian territories came under Napoleon's rule *en famille*. If one characterizes all of

these conquests as state extinctions, then the Napoleonic Wars are another mass state extinction. Even with Austria and Prussia left out of the equation, French rule by occupation or Napoleonic nepotism led to the extinction of an unusually high number of states. [Note to readers of the draft: I need to provide exact data on the Napoleonic Wars eventually.]

One might of course examine state births in addition to state deaths. Under a military-occupation definition, one almost always leads to the other, unless the conqueror annexes all of the loser's territory. All of the nations conquered and then militarily occupied during World War II, whether by the Axis or the Allies, died and were then reborn. Additionally, however, there are instances of multiple state births flowing simultaneously from the dissolution of the parent: Austria-Hungary gave rise to several successor states, as did Yugoslavia and the Soviet Union in more recent times. When one examines state births as well as deaths, the punctuated nature of changes in states' existences becomes even more apparent, as Table Two shows. (Note that a state death without a state birth is possible under the Correlates of War Project's definition of a state, as occurred in the unification of West Germany with East Germany or of North and South Vietnam.) [Note to readers of this draft: There is no Table Two. The basic idea, though, is that a state death frequently leads to a state birth, and that some state deaths (like the USSR) lead to a whole bunch of state births. So including state births tends simply to amplify the distinctiveness of periods displaying high rates of state death.]

What is the implication of a punctuated equilibrium in state survivals for the neo-realist arguments about selection pressure on states? In the biological case, evolution by punctuated equilibrium emphasizes the role of chance and downplays the prominence of fine-tuned natural selection operating over extended periods of time. The analogy to international relations, given the data, seems a close one. Nations conduct their foreign policy and then prosper or die, not in accordance with a reward for fitness cultivated over time, but by chance. As Fazal shows, buffer states are particularly likely to meet their demise. The difficulty of developing sufficient fitness to survive in the international system extends beyond those whose geopolitical bad luck places them between the



political equivalents of Scylla and Charybdis, however. France is a great power, but it fell to Germany in World War II, along with virtually every nation in continental Europe whose name didn't begin with "S." Did Switzerland and Ireland, for example, conduct their foreign policies with so much more aplomb than Belgium and Norway that the latter were deservedly prey to Germany while the former were not?

More generally, it is Europe that seems to possess the equivalent of a meteorite magnet; other continents seem able, with the possible exception of colonization, to avoid the mass extinctions that visited Europe as a result of the Napoleonic Wars and World War II. In Fazal's table of state extinctions, 30 of the 43 extinguished states are European. A European state is not readily able to move to another continent no matter how sophisticated its foreign policy.

Even in a punctuated equilibrium, of course, there is selection on *some* criterion—distance from Germany is a good candidate, at least in many cases—that accords with fitness in some very rough sense, but that selection does *not* appear to be based upon a small comparative advantage in foreign policy held by one entity over another as the result of an accumulation over long years of advantageous factors. The neo-realist case is thereby weakened.

#### IV. Salvaging Neo-Realism?: Extensive Analogies to Evolutionary Biology

As described in the previous three sections, neo-realist theory does a poor job of incorporating evolutionary theory. Neo-realist arguments are logically incorrect if they assert that low contemporaneous state death rates invariably imply strong selection pressures in the international system. Neo-realist arguments are empirically undermined by the large net gain in the number of states in the international system since 1816. Neo-realist arguments are further undermined by the likelihood that international politics is a system of punctuated equilibria (in which luck plays a large role) rather than a system of gradualist change (in which fitness—i.e., a rational, egoistic foreign policy—would play a large role).

Given all these difficulties, current adherents of neo-realism might be advised simply to shutter the neo-realist school of thought and move on. Alternatively, neo-realists might try to salvage the selection-oriented portion of their school of thought and then, with its conceptual foundations shored up, continue in session. This section of the paper attempts salvage and then sets out two extensive sets of analogies between international relations from evolutionary biology, with a brief description of the advantages and disadvantages of each analogy to theorists of international relations.

Salvage is not impossible. A revisionist-minded neo-realist might first back off from the assertion that currently low state death rates demonstrate strong past selection pressures. Low state death rates do not disprove the existence of strong past selection pressures, but they also do not prove their existence unambiguously. A more direct examination of the period assumed to involve strong selection pressures is a superior approach. (Of course, such an examination may not produce much evidence of state deaths, either.) As to the invariability in selection pressures necessary for the existence of highly fit contemporary states, the neo-realists can fall back on assertions that the essence of foreign policy remains as it was before the Cold War, or before the Concert of

Europe, or before the Peloponnesian War. States must either become and remain strong, or somehow preserve themselves against threats from stronger nations. Wise diplomacy, in this view, remains as crucial a determinant of state persistence now as it did in the past.

The nearly explosive net increase in states since 1816 is a more direct challenge to neo-realist assertions of strong past selection pressures, but the mere existence of the increase does not conclusively show that selection pressures are minimal. The introduction of a bacterium into a nutrient-rich agar will lead to exponential growth in the bacteria during that period when neither the size of the dish nor the level of available nutrients is constraining bacterial growth. Perhaps, the neo-realists might argue, the post-1945 explosion in the number of states (and sharp drop-off in death rates) is unsustainable. Strong selection pressure may be just around the corner. (One might, however, caution such neo-realists that continuously arguing for the future relevance of selection pressures, regardless of past or present evidence for their existence, sounds suspiciously like the advancement of a non-negatable hypothesis.) Alternatively, a finer-grained analysis of state extinctions might, in a way that gross numerical comparisons cannot, show the operation of selection pressures dependent upon foreign-policy decisions rather than the happenstance of proximity to one or more expansionist powers.

The existence of a punctuated equilibrium in the number of states undercuts the assertion that highly fit states exist in response to long-present, high selection pressure. Still, fitness of a sort is present even in a punctuated equilibrium. The organisms that survive a catastrophe are well adapted to post-catastrophic conditions, while those that perish are not. Selection for post-catastrophic fitness accords with the general concept of natural selection even if the fitness in question is of only transient importance and possessed by only a few organisms.

The balance of this section assumes that one may salvage the aspects of neo-realism that depend upon selection-oriented arguments. Even if one makes this assumption, however, there remains the question of just how one might adapt or analogize evolutionary theory to international relations. One approach is to embrace the

elasticity of metaphor and then state, in effect, that selection of some sort happens or at least could happen, and that states currently in existence are certainly fit enough not to have died. Such a formulation may strike some as excessively vague or nearly tautological, but extremely broad metaphors play a role in many theories of international relations.

An alternative approach would be to search for extensive plausible analogies between evolutionary biology and the state system, and then examine the theoretical or empirical implications that flow from choosing a particular analogy. Neo-realists have already performed a similar analysis with respect to the analogy between the perfectly competitive marketplace and the international system, with the state analogized to the firm, national security analogized to market share, and so on. An examination of imperialism as analogous to a firm's decision whether to integrate vertically or contract with other firms is one product of the analogy that might not have been undertaken if the state-firm analogy had not already been developed.

One potential set of analogies between evolutionary biology and the state system would be to analogize the state to an individual organism in a given species. The state in this view is the member of a population (of all states taken together). The state would possess observable traits, including its foreign policy. These observed traits would be a product of the natural (international) environment and the state's genetic complement. Just what constitutes the state's genetic complement, however, is a thorny issue. Very little in a nation remains nearly constant in the way that genes in an organism do. Genes control the production of proteins that in turn serve a dominant role in cellular metabolism, but no particular structures or institutions in a state plainly dominate all others. Is the output level of a nation's economy, for example, a "gene" that contributes to the determination of foreign policy, or is GDP instead a "trait" upon which selection may act directly? More stable characteristics of a state may be more closely analogous to the organism's genes, such as the nation's physical location, its type of political regime (democracy, autocracy, theocracy, etc.) or its economic system (planned, mixed,

capitalistic, etc.). One might also imagine that these broad structural characteristics of a state dominate many other institutions.

Analogizing states to organisms has a number of attractive features. The analogy matches various levels of analysis in evolutionary biology—population, organism, trait, and gene—with relative ease. Variation among states is certainly observed, just as is variation among organisms within a species. Organisms are born and die, as do states in the international system. The analogy sets forth a category of features—the traits of a nation—that is inclusive enough to provide a place for a welter of real-world phenomena.

This biological analogy also provides some assistance in categorizing events—such as state reunification or voluntary state dissolution—that appear to fly in the face of a rationalist foreign policy privileging the existence of the state. If the primary purpose of the rational state is to preserve itself, what rational state would ever commit suicide? Yet countries that have survived for decades in the supposed rough-and-tumble of international politics sometimes voluntarily extinguish themselves, as in the case of the Democratic Republic of Germany (East Germany) or the internal decision of the Soviet Union to dissolve. The biological analogy readily allows for the fact that some genes or traits do not enhance survival, not because of a conscious (and thus rational) choice but because of factors (the genetic complement of institutions and other state assets) outside of the state's control.

These same phenomena do provide a difficulty for the analogy of state to organism, however. Organisms, at least beyond the uni-cellular level, do not typically merge or fragment but instead retain a unique physical integrity from birth to death. There is some temptation to call those states resulting from the fragmentation of an existing state (as with the transformation of the Soviet Socialist Republics from administrative provinces of the Union of Soviet Socialist Republics into more than a dozen independent states) the “offspring” of the “parent” state. In temporal terms, after all, the parent state does give rise to the offspring states. Perhaps one can ignore the fact that, typically, organisms do not inevitably die to give birth.

Organisms that reproduce asexually, however, pass on exactly their own genetic complement to their offspring (barring mutations). Organisms that reproduce sexually require a mate. “Offspring” states do not possess exactly the same complement of institutions and assets—the analog to the “gene,” though an analog somewhat unclear in its operationalization—as the parent state. No “mate state” is necessary for fragmentation to occur. Even if one overcomes these barriers, there is the fact that no ready analogy to state merger exists if states are analogized to organisms of the same species.

This difficulty highlights a larger challenge in analogizing states to organisms. An organisms’ genetic complement remains unchanged from its birth to its death (barring the rare mutation). If state entry into and exit from the international system are its birth and death, as we have been assuming throughout, then whatever is analogous to the organism’s genetic complement should remain unchanged. Yet we observe quite dramatic internal changes in states during their lifetimes—including, at least if we adopt a conquest-oriented definition of state death—fundamental changes to state politics and economies. Indeed, literally *anything* can change within a state so long as it meets the external criteria for a state in the international system.

One might try to reduce the gap between permanent genetic complements and ever-shifting state characteristics by counting some changes within states as the death of one state and the birth of another. These changes, at least, would then not imply a change in genetic complement but rather the existence of a new organism with its own genetic complement. If, however, we react to this problem by changing the definition of state birth and death from an external model to some internal characterization—defining a genuine political revolution as the “death” of the pre-revolutionary state and the “birth” of a new, post-revolutionary state, then we are generating a new host of problems. First, states could then be selected out of the international system without the generation of any selection pressure *by* the international system at all. Second, internal definitions are difficult. If a revolution is sufficient to signify state death, the rationale is presumably

that the decision-makers in the state and their methods for making decisions have fundamentally changed. But why then is a change in ruling political parties within a constant regime type not a state death? The decision-makers have changed, after all, and therefore those controlling foreign policy have changed. What of a change in the identity of the US President while the President's party remains constant?

Indeed, the analogy of organism to state carries with it a related, subtle subversion of the neo-realist's insistence on the primacy of external factors in a state's formulation of foreign policy. Once the state is the organism and the population of states is the analogy to the population of organisms, a Darwinian approach would consider evolution to be changes in the relative frequencies in the population of "genes" within states. This approach immediately directs attention to the *internal* characteristics of states—their "genes"—rather than the (external) features of the international system. An analyst of international relations who focuses, say, on whether a democratic regime conducts its foreign policy more competently than an autocratic regime is likely to start sounding like a comparative politician or a Liberal IR theorist fairly soon, not like an advocate of neo-realism arguing that the structure of the international system is the primary determinant of events in international relations.

The analogy of states to organisms therefore involves a number of discomfiting differences revolving around the fact that states are not as cleanly compartmentalized, in time or in space, as natural organisms. The analogy also highlights the possibility that foreign policy is not, despite the neo-realist assertion, the primary determinant of state success. After all, an organism's success is determined by the interaction of the entirety of its genetic complement with the natural environment. A few mutations are lethal, but the vast majority of expressed traits bear only a minor selective advantage or disadvantage. The "genes" determining foreign policy would then be relatively minor players compared to the aggregate of other "genes" characterizing a nation's polity, economy, society, location, and natural resources. Selection *on foreign policy* then becomes a much more laborious process than it would be in a neo-realist world where nations live on the knife-edge of survival with each major foreign-policy decision. A

nation could conduct its foreign policy with indifferent competence and still survive as a result of the positive contributions to survival of its other traits, just as an organism may have some important weaknesses compared to its species-mates yet easily live to reproduce.

More abstractly, one might note that state birth and death is a fairly crude measure of success. Has the United States been equally successful in its foreign policy throughout its history merely because the United States has not yet perished? States gain and lose territory, influence, population, and resources with great frequency. A view of states measuring their merit only upon birth or death plainly misses a good deal of interesting phenomena relevant to the struggle for power that the neo-realists wish to place at the center of analyses of international relations.

An alternative evolutionary analogy to that of states and organisms is available: the analogy of each state to a species.

The process by which species develop is of interest to biologists. Indeed, Charles Darwin's most famous work is entitled, "The Origin of Species." Geographical isolation of one population of a species from another can lead to reproductive isolation, and thus to speciation, especially when small numbers of organisms are involved in at least one of the populations and when selection pressures in one geographical area differ significantly in type or magnitude from those in another geographic area. Species, whether closely related or not, may compete with one another for limited natural resources. Individuals in one species may, as a result of the individuals' particular genetic complements, fare better than individuals in another species. If all individuals in a species disfavored by natural selection eventually fail to live to reproductive age, then their species becomes extinct.

If one begins by analogizing the state to an entire species, then the international system as a whole might be analogized to an "ecology" of nations. Within this ecology, a nation, like a species, can become extinct. A nation, like a new species, can arise. This



state-species analogy presents many of the difficulties of the state-organism view, but it does have some attractive characteristics of its own.

The first is that it to some extent avoids all the problems stemming from the lack of clear boundaries within states between analogs to genes and traits, or between parent and offspring. If the species is the analogy to the state, then the state may contain within it complicated patterns of mutations and of births and deaths without great harm to the analogy. Within a species, after all, organisms are born and die, with the aggregate measures of gene frequency in the population changing with every mutation, but the species remains.

The second advantage of a state-species analogy is that it naturally allows for subtler measures of evolutionary success than merely the speciation and extinction of a species, whereas the state-organism analogy is, as discussed above, less flexible in this respect. A species has a population. A species has a range. Larger populations and a larger range are indicators of a species' success or fitness, indications subtler and more continuous than a species' birth or death. A species has close competitors and distant competitors. A species has a place in the food chain. While these role-oriented measures are descriptions and not directly a measure of a species' success, they do allow for a richer characterization of a species' role in the ecology of its environment. To highlight differences among states along these role-oriented lines provides a more nuanced vocabulary for international relations than simply measuring whether a state persists. They also imply the ability of states to find a niche and to prosper, even if the state would lose a direct confrontation with other states. The neo-realists may be uncomfortable with this acknowledgment that the acquisition of pure power is not the only way for a state to thrive. More broadly, the view of states as species in an ecology allows for the possibility of some rough equilibrium in international relations rather than the endless shifting dynamics imposed by a ceaseless struggle for relative power. Ecologists are learning that nature itself tends less towards some steady end-state than once was thought, however, so perhaps the neo-realists will prove in this instance to have been one step ahead of the scientists.

The scorecard on the state-species analogy's treatment of fragmentation and unification of states is mixed. Fragmentation of biological populations into species is probably the dominant means of speciation, so the fragmentation of one state into others present no conceptual barriers at all to adoption of this analogy. Unification of species, however, is effectively impossible: a species is by definition reproductively isolated from members of other species and so recombination is effectively barred. Nations, in contrast, do unify.

Both analogies of international relations to evolutionary biology—state-organism and state-species—present some difficult issues of characterization and consistency. Both imply some important phenomena in international relations, in both cases including phenomena that are inconsistent with at least the conceptual emphases of neo-realism. One may always dismiss the discomfiting portions of an analogy as inapplicable while retaining those portions that resonate with the theorist, but one must tentatively judge, at least, that close, extended analogies of international relations to evolutionary biology are unlikely to rescue neo-realism from the difficulties that neo-realists face when they ignore evolutionary biology.

**Table One: State Deaths by Year, 1816-1996**

