SEVEN
INCORPORATION OF
THE NEO-DARWINIAN MONOPOLY

A shy, retiring monk is at work in the garden of what is clearly a monastery likely somewhere in Europe. We move in for a close up. The face is bluff, clean-shaven, black hair neatly combed, with the firm jaw of, if not a fighter a man of undeviating determination, eye glasses sparkling with the light of early morning.

His gaze concentrated on the odd task at hand, he is clipping the anthers from the bloom of one of scores of blue, white, and multi-colored sweet peas on vines wrapped around the supporting poles that surround him. He next dusts the stigma for the bloom with some pollen from a bottle in his cassock. Then he puts a small sack over the bloom, gently tying it in place.

This is Gregor Mendel, the Austrian monk for whom not just half his contribution, as had been the fate for Darwin, but all of it was essentially lost, and then after his death dramatically rediscovered, changing everything.

Following Weismann and Wallace, the concentration for the new evolutionists pretty well generally settled on natural selection as the big, over-riding, master principle for evolution. The theory was still under fire not only from the Church, however, but from scientific holdouts. Contrary to the impression that acceptance came quickly, it would be a half century before natural selection gained reasonably wide acceptance.

The delay came because of how the action had turned to the lesser of the great pair—the squirming Variation of all the organisms little and big, which Natural Selection was supposedly out there somewhere in biological space hovering to select from.

One of the most persistent of investigators now nibbling at the question of what might prove to be the most viable theory was Gregor Mendel. Others were at work cross-breeding plants to look for changes from parent to child. But he was the sole Sherlock or Hercule for biology's mystery story who over seven years

was to persist in cross-breeding an estimated nearly 30,000 sweet peas while keeping the careful records that were to help establish the new science of genetics.

For thirty four more years others would wrestle over the question of how the changes of variation were passed on from generation to generation for natural selection to select from. But early on Mendel had much of what his successors came to agree was the answer. In the relatively inflexible ratios for dominant, regressive, and hybrid strains for white and red varieties of sweet peas, his patient labor and records began to reveal the pattern for the transmission of traits for all organisms: plants, animals, and ultimately ourselves.

He privately published his findings, sent copies to leading scientists of the time, and was mostly ignored by all but one of them. The contribution of this eminence, Swiss botanist Karl Wilhelm von Nageli, was to suggest that Mendel might do better by switching from sweet peas to another plant. This sent poor Mendel off into a biological blind alley so discouraging that he decided to give in to pressure to become Abbot of the monastery with no time for science any more. He died, however, confident that his was a major discovery, of which the importance would be recognized some day.

"Some day" became thirty four years later. In a replay of the simultaneous Darwin-Wallace discovery of natural selection, Mendel's work was independently rediscovered by three scientists, in Holland, Germany, and Austria. Soon thereafter the incorporation of the Neo-Darwinian monopoly that Romanes had decried began to widely take hold.

Achievement of the Neo-Darwinian synthesis was unquestionably not only a major achievement for 20th century science. It still affects areas of our lives today ranging from the quantity and quality of food we eat to the wide range of drugs and medicines for medical treatment, both major factors in why many of us live so much longer today than earlier. How and by whom this edifice was constructed is vital in this context. As by now the story is well known and well told elsewhere, I will only briefly sketch it in terms of a few key figures.

The Battling Bateson

A crucial role in the acceptance of innovations is that of the brash champion for innovator. Darwin's champion had been his formidable "bulldog" T.H.Huxley. For Mendel a posthumous champion emerged out of a battle between two biologists who were at first friends, and then—in keeping with the

systems grip of survival of the fittest—became the bitterest of enemies.

Mendel's bulldog was the battling biologist William Bateson. Father of today's better known son, anthropologist Gregory Bateson, Bateson senior began his study of evolution with an exotic marine worm known as *Balanoglossus*. On shifting to shellfish within salty ponds in the Central Asian steppes, he reached the decision he was to literally worry like a bulldog for years to come. Darwin's belief had been in evolution as a slow, gradual process. Bateson, however, decided on a radical break. Evolution moved ahead, he claimed, with "saltations." One might think this term referred to the salty ponds for Bateson's shellfish. But though that might have been the original impulse, soon throughout the field of biology this became a fighting word with the insider power of derivation from the Latin—"saltus,"not for salt, but meaning "to leap." Thereafter, the literature is saturated with "saltation" and "saltatory" for what one would normally call a jump ahead or break in process.

It also occasionally became the word for what we know today as "mutations" and later "punctuated equilibrium." But in the rapid pile up of contradictory semantics by now biology seemed headed for an Alice in Wonderland world where things were often not what they seemed or were called.

The friend who became an enemy was Walter Frank Raphael Weldon—known as Raphael in his time to differentiate him from a wellknown father named Walter and a brother named Dante.

Rising rapidly to eminence at Cambridge University, Raphael began as predominantly a crab man, but soon abandoned crabs for a passion for the then new field of statistics. Here, it seemed obvious to him, was the answer to the questions of evolution at all levels.

Here was this field slipping and sliding all over the place for lack of a sufficiently sophisticated level of measurement. And here was statistics, like the arrival of the Lone Ranger on the scene. Moreover, behind the rise of the statistics that entranced Wheldon lay the amazing story of Darwin's brilliant cousin, Francis Galton. A child prodigy who was reading by the age of two, who at age five knew some Greek, Latin and long division, by age six Galton had moved on to Shakespeare for pleasure, and poetry, which he quoted at length.

Galton went on to become the most ingenious of pioneers in the development of measures and methodologies for psychology and the social sciences more generally. Correlation, normal distribution, standard deviation, regression toward the mean, regression analysis, the first use of questionnaires

and surveys—all these hefty statistical tools for research were Galton's invention.

Within Galton's genius for measurement, Weldon saw the potential for using the new statistics to track change from generation to generation among species. Not only did the solution to the mystery of variations seem at hand. The heady thought of making one's mark by toppling the master beckoned. For it seemed to Weldon that he might be able to find and show that the hypothesized over-riding power of natural selection could be explained by nothing more than quirks of process at the supposedly lowly variation end.

Moving to Oxford University, he teamed up with pioneering biometrician Karl Pearson. Joined by Galton himself, out of a Royal Society committee the three issued a historic statement.

"The questions raised by the Darwinian hypothesis are purely statistical," they proclaimed, "and the statistical method is the only one at present obvious by which that hypothesis can be experimentally checked."

Out of throwing down this gauntlet came Weldon's collision with the battling Bateson. For not only was Weldon a gradual process man. He took out after Bateson's pet idea of saltation and the saltationists.

"Bateson had done a nice job of assembling the facts, but his interpretation of them was seriously flawed," a historian notes of Wheldon's patronizing digs.

To further rub salt in the wound, as Bateson claimed Mendel's work was evidence of saltation, Weldon began to pooh pooh the significance of Mendel.

They were both extremely bright, eloquent, and—even for science—particularly vituperative advocates for their positions. Of the Weldonites, Bateson raged against their "perverse inference, " "slovenly argument," "misuse of authorities, reiterated and grotesque." He accused them of not "acting in good faith as genuine seekers for truth." Weldon died in 1906, but the argument raged on between Bateson and Weldon's ally, the notably even more vituperative Karl Pearson.

Meanwhile, others were quietly raising what now seems the obvious question: Why couldn't it be both? Why couldn't it be gradual process with also now and then jumps?

Morgan and the Sexual Economics of Fruit Flies

A jumps man who was also skeptical about both Darwin's principle of natural selection and Mendel's ratios for the transmission of traits for sweet peas

now enters the picture. Thomas Hunt Morgan began his search for answers at the lowly level for variation with sea spiders. Then—in keeping with the long established "baby step" level for Darwin with barnacles 100 years earlier—he moved on to sea acorns, ascidian worms, frogs, sea urchins, fish, and earth worms. Then with a move to Columbia University, he graduated to the work with fruit flies that made him famous worldwide.

Of all the creatures studied by the workers and management for the sure and steady spread of the Neo-Darwinian monopoly, *Drosophila Melanogaster* was to prove the most productive of choices.

"It could be bred by the thousands in milk bottles,"Darwin biographer Ronald Clark notes. "It was easy to find, needed little space, cost little and lived on simple food." Most importantly, where with humans you had to wait up to twenty years for a parent to produce a suitable child for experiment, a *Drosophila* egg "hatched, turned into an adult, and was itself producing more eggs within ten days."

Starting in 1908, in the 16 by 23 foot space for his famous "fly room," Morgan supervised the mating of thousands of *Drosophila*—estimates range from 10,000 to 30,000 of them.

For two years nothing notable happened, then early in 1910 came the first experimental production of a bona fide mutant—a white-eyed fly after two discouraging years of the mating and birth of nothing but red-eyed flies. Thereafter, the sex life of the fly room came to rival the tabloids and Hollywood scandals as Morgan's fundamental contributions to science spread from the scientific journals out through the popular media internationally.

At last the function of the chromosome and the gene in the transmission of variation became clear. Particularly compelling was Morgan's description of how in the flow of chromosomes genes were both linked to one another and crossed over in the matings to produce variants within species. Indeed, so widely gripping was Morgan's description of sex as the selector that it threatened to unseat Darwin's natural selection as the prime driver.

"Nature makes new species outright," Morgan wrote. "From this point of view, the process of evolution appears in a more kindly light than when we imagine that success is only attained through the destruction of all rivals ... Evolution is not a war of all against all, but it is largely a creation of new types for the unoccupied, or poorly occupied places in nature."

This concept of variations seeking a niche to fill, I feel compelled to remark,

was another one of many observations reaching far into the future that I found in the lost Darwin, which I'm currently pursuing.

Fisher and the Power of Numbers

The next player to stroll upon our stage—or more to the point, worker to be employed, should we say—was the notably handsome, near-sighted, and for a time massively under-employed Ronald Aylmer Fisher.

Though like Galton early displaying a remarkable aptitude for mathematics, young Fisher was blocked from getting anywhere that mattered by World War I. Bad eyesight prevented him from joining the British army. He lacked credentials for anything else that mattered, so he settled for clerical work and small teaching posts. Only after the war did he gain peripheral entry into the world of science as a journalist. It was during this period, however, although lacking the credentials to be recognized, and from on high ignored, he wrote one piece later rediscovered and acclaimed a major work.

What at last looked like Fisher's great opportunity to be taken seriously came when he submitted an article to biometric mogul Karl Pearson for approval.

After delay, in a brief dismissive note, Pearson finally replied, "I do not think in the present state of affairs that the paper is wide enough to be of much interest from the biometric standpoint." Shortly afterward, in 1918, urged on by Darwin's son Leonard, the Eugenics Education Society sponsored publication through the Royal Society of Edinburgh; and at last Fisher—and NeoDarwinism's big problem—was underway.

For in the paper dismissed by Pearson, Fisher provided the scientific jump from subhuman to human evolution. By applying his genius for mathematics, Fisher had shown how both the biometric approach to large populations and the results of Mendel's experiments could be synthesized and applied to directing the evolution not just of fruit flies, et cetera. Nor just to the development of better strains of corn or herds of beef. Now it looked like the road was clear to the use of evolution theory in experiments with the most difficult but greatest of experimental animals: ourselves.

This leap ahead confronted Fisher, all other evolution theorists, and indeed all of us today with the ancient moral and political question that now became the dilemma for science: how might one develop and apply a new science of evolution to breed better humans.

Of deep, abiding, and in our time now of critical evolutionary importance, it shoved a psychologically, politically, and economically naive group of biologists out into the portentous overlap between the field of science and the realities—and what could all too easily become the horrors—of politics, economics, and morality.

The Eruption of Eugenics

Politically, Fisher was an ardent conservative. Behind him lay the traditional conservative alignment to heredity. A mere 150 years earlier the divine right of kings had prevailed as the supreme example of a belief in a fundamental split within humanity between privileged and non-privileged blood lines.

Along with this belief had come the enduring split into higher and lower classes, favored and disfavored races, and, most fundamentally, male domination and female subordination.

For the burgeoning Neo-Darwinians, all this matter of classes, politics, and dominators and dominatees was, of course, outside the proper realm of science.

It was that messy world one dealt with in one's own private ways. Inevitably tainted by a non-scientific "subjectivity," it was this periodically troublesome matter one had to consider when going for grants from foundations or governments. But outside the purview of the new science of evolution they were building, the onrushing sweep of history was inescapable. With the French Enlightenment and American revolution had come the shift away from heredity to environment as the liberal and progressive answer to the question of how we are to shape the better human.

"Give me your tired, your poor, your huddled masses yearning to breathe free" was emblazoned on the base of the Statue of Liberty.

But now, with the shift from a focus on prehuman to human evolution, the Neos were confronting the world with hard new evidence that heredity was a primary, if not even *the* primary consideration for the advance of human evolution.

What the new science revealed—to which a majority of scientists were slow to comprehend and respond—was a monumental shift in responsibility. From the religious point of view, no longer could human evolution be left up to God. Nor from the scientific point of view, given the new understanding of the power of the dynamics of variation, could the world be left to drift willy nilly with no

guidance other than what a hypothesized blind Natural Selection provided. Both the nature and the desired direction for our species and planet seemed to call for Artificial Selection on the grand scale.

It was clearly up to science and enlightened political leadership to more directly and effectively intervene in evolutionary process.

Behind the challenge now raised by Fisher's work—how might one best develop and apply a new science of evolution to breed better humans —was Darwin's own sentiments in the matter of selective breeding that soon became the burgeoning eugenics movement.

Most powerful was the alignment of Francis Galton, founder of eugenics, of British philosopher and pioneering systems scientist Herbert Spencer, of early day German evolution theorist Ernest Haeckel, Karl Pearson, and among many other famous names for the time H.G.Wells, George Bernard Shaw, and even Sidney Webb, founder of the ultra-progressive, socialist Fabian Society.

Among biologists against the eugenics movement was Morgan, but the chief opposition came from progressive American sociologists, such as Lester Ward and Charles Cooley—both of whom saw in eugenics a spin off from the pernicious doctrine of Social Darwinism and survival of the fittest.

And so we come to the final scene for Act II. The question of how far and how fast they could or should go with eugenics now faced the Neo-Darwinian. Skirmishes on this and pure scientific matters were continuing. Now and then, however, came a lull permeated with a sense of expectancy. Now with a roll of the drums from the media there arrived on the scene a band of both familiar and unfamiliar players headed by the man of the hour: biologist Julian Huxley, grandson of Darwin's bulldog T.H.Huxley.

Huxley, Dobzhansky, and the Great Synthesis

Gifted as a writer, by nature an excellent synthesizer of the work of others, Huxley sounded out the principal biologists of his time, then in 1942 published *Evolution: The Modern Synthesis.*

Here at last, in this massive 600 page work, divisions were bridged and for a time many arguments were ended. For here was a decisive wedding of the still hotly debated Darwin and Wallace principle of natural selection with the explosive, contentious probe of the nature of variation following rediscovery of Mendel's launch for the impending reign of the gene.

Specifically, the new synthesis consisted of a consensus among the principal players that "gradual evolution could be explained in terms of mutations and their recombination, which produced genetic variation worked on by the process of natural selection; and that evolutionary phenomena, including the macroevolutionary processes and speciation revealed by paleontology, could be explained in terms of known genetic mechanisms."

Within the image of the incorporation of a Neo-Darwinian monopoly, you might say that for a while Julian Huxley served as the chairman of the board. Among the board members were the man of the hour for the eugenics movement Ronald Fisher, key contributors to evolution theory J.B.S. Haldane, Sewell Wright, E.B. Ford, Ernst Mayr, Bernhard Rensch, Sergei Chetverikov, George Gaylord Simpson, and G. Ledyard Stebbins.

In a special relation to Huxley there was also the biologist who in a sense served as co-chairman, the Russian born geneticist and evolutionary biologist Theodosius Dobzhansky.

It was an enormous accomplishment. Sending waves of immense influence out through all the fields that determine what is and what isn't to be included in our minds, it deserved every bit of the celebration it's received as the most important achievement in the science of living systems during the 20th century.

All seemed to be for the best in "the best of all possible worlds"—except for two problems. One was the concern of the outsiders. For outside the board room of Neo-Darwinism, Inc., hammering on the door, or refusing to wait any longer and storming out, were the unhappy share holders for Planet Earth. Primarily they were social scientists. But also many other bewildered and frustrated customers and consumers, both secular and religious, were clamoring for change.

From the viewpoint of the excluded and the uneasy and dissatisfied, what unfolded thereafter was the primary battle for 20th century and now 21st century mind.

Within the mind space for biology, and more generally natural science, this was a battle that to the outsider often seemed little more than a distant tempest in a teapot.

It pitted, and was proclaimed by the fight crowd, a battle of "reductionists" versus "expansionists." At the core it became the struggle between those who claimed the secret to evolution could be found and solved within the tiny life and territory of the simplest possible of organisms, and those who claimed the exploration and understanding of evolution must radically expand to embrace a

much wider territory.

Within science it was by and large a gentlemanly and gentlewomanly argument between those steeped in a theory of evolution oriented to the past versus those working to build a theory not only oriented to but useful in shaping the future.

It was, one might say with progressive bite, an argument between proponents of a theory of subhuman, inhuman, and inhumane evolution versus the proponents of a theory of human evolution. For the politically sensitive one might say it was about a theory all too much about adaptation and accommodation and all too little about assertion and aspiration. Or as a street fighter might put it: A theory of knuckling under versus a theory of standing up to fight for one's rights.

But out beyond the mind space of science now loomed the much larger problem of a reality spawned by science now running wild, out of control.

In the name of Darwin, Mendel, and the seemingly iron-clad doctrine of eugenics, long priding itself as being the home of the brave and the free, the United States became the first country in the world to enact compulsory sterilization for the mentally retarded and mentally ill, also the deaf, blind, epileptic, and the physically deformed.Native Americans, as well as African-American women, were sterilized against their will in many states, often without their knowledge while they were in a hospital for other reasons, for example, childbirth. To curb the supposed transmission from parent to child of possible "criminal" genes for a while it also became a popular treatment for prison inmates.

In the end, prior to 1931, over 65,000 "defectives" were sterilized in 33 American states under state compulsory sterilization programs, with laws to this effect remaining on the books as late as 1956.

Now, within the overlap between the mind space of biology and the mind space of politics, economics, and religion, began what by the 21st century was to loom as the proverbial fight unto death.

On one side, based on the degradation of the Darwinian first half trumpeted by Social Darwinism, were the advocates and exploiters of a theory of survival of the fittest and selfishness *uber alles* as the driver for human evolution.

On the other, keying without knowing it to Darwin's "lost" completing half, were the increasingly deeply distressed advocates of a theory of love and moral sensitivity as the driver of human evolution.

And out of the ensuing confusion and mess of science, politics, economics, religion, and morality rose Adolf Hitler and the Nazis.