

**THE LIFE HISTORY  
OF AN  
AMERICAN NATURALIST**

By  
**FRANCIS B. SUMNER**  
*Emeritus Professor of Biology  
Scripps Institution of Oceanography  
University of California*

**THE JAQUES CATTELL PRESS  
LANCASTER, PENNSYLVANIA.**

Copyright 1945, by  
THE JAKES CATTELL PRESS

PRINTED IN THE U. S. A.  
INTELLIGENCER PRINTING COMPANY  
LANCASTER, PENNSYLVANIA

## PREFACE

The present narrative was commenced and parts of it written eleven years ago. The plan to write such a narrative was conceived many years earlier. During the past ten years, the manuscript has been both trimmed and supplemented and in many ways revised. At intervals it has gone into cold storage for a year or two. As here published, it purports to speak for my present self, but this can do no harm. Any views expressed are still my own. Whether the outcome of these labors has justified such an expenditure of time and effort is a question for my readers to decide. My own opinion in the matter fluctuates violently from moment to moment as I reread it.

In pursuing the present enterprise, I have become acutely aware of the difference between presenting scientific "results" to fellow specialists and publishing a non-technical book for the entertainment of lay readers. In the former case, the main consideration is what the author has to say; in the latter case, it is how many readers will be interested. This last point of view has not hitherto concerned me very much. From the publisher's standpoint, it is, of course, all-important.

So far as the "reading public" is concerned, the writer of these pages is admittedly quite unknown. To the comparatively small group of his fellow-specialists he is known as a biologist of mature years who has contributed numerous articles to various technical journals, both American and European. He has even received a few of the decorations by which achievements in the scientific world are recognized by one's colleagues. Needless to say, however, such tokens of recognition as these do not suffice to place him in the class of "well-known" persons from whom autobiographies would normally be expected by the readers of books.

Oliver Wendell Holmes, the elder, remarked that "every articulately speaking human being has in him the stuff for *one* novel," that, of course, being the story of his own life. Note that Holmes did not say *every human being*. The ensuing sketch of my life is undertaken in the belief—or shall we say under the delusion?—that I am better qualified than the average person to prepare such a narrative. My advantage, for present purposes, depends in large part upon what would generally be regarded as an extremely questionable virtue. I incline to be more ruthless than most persons in stating what I believe to be the truth, regardless of the consequences to myself or the feelings of others.

The fact of my venturing to publish in some detail the story of my life may be taken to denote a high degree of egotism. Plainly, it would seem, I must credit myself with some degree of importance in the affairs of the day. And I fear that my own emphatic repudiation of any such delusions of grandeur may not be convincing to the reader. In reality I crave, like most other research workers in science, a wider opportunity for self-expression than is afforded by the publication of my technical contributions—an opportunity, one might say, to "stretch" spiritually. Add to this—if there is really any difference—the quest for that form of psychic relief which has been termed "mental catharsis," this being merely a high-brow expression for getting a thing off one's chest.

The author of an autobiography has the advantage, too, of being able to launch some of his long-cherished ideas—his prejudices, if you prefer—freed from the necessity of supporting them at all times with watertight evidence. As parts of the biographical picture they are facts, whether or not they will stand up as descriptive of the real world. A scientific man should not stoop, you will say, to such legalistic chicanery as this. Perhaps you are right.

You are certainly right, too, if you insist that no products of such purely egotistic motivation as I have thus

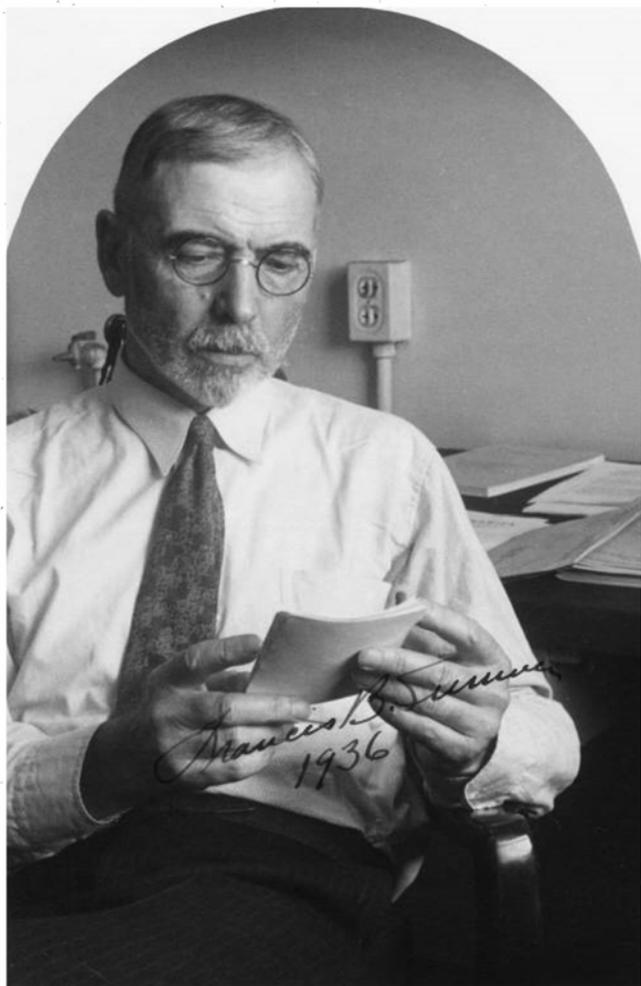
far acknowledged suffice to justify a bid for your serious attention. On the other hand, may I not assume that the life history of a contemporary man of science, narrated accurately and with as little reserve as possible, is likely to have some interest and value to many besides his fellow-specialists? In this connection, skill in literary presentation is an asset nearly as important to the author as leadership in his particular field of science. And here I cannot but wonder whether some of my colleagues would not rate me higher in the art of literary expression than in the art of scientific discovery.

Such a degree of frank self-revelation as is contained in these pages may reasonably be denounced from the standpoint of good taste. I should not, indeed, have been guilty of such indiscretion earlier in life when it was important to avoid too great deviations from conventional lines of conduct. Now, with my life-strategy brought nearly to completion, I feel less coerced by the consideration "What will people think?" and more disposed to yield to the craving for self-expression. The whole performance is "immodest," no doubt, though the meaning of that word is nothing if not relative. The standards of modesty of the bathing-beach, for example, are quite different from those of the street, while those of the nudists' colony are shockingly different from either. Some autobiographers, among whom we may mention Benvenuto Cellini and H. G. Wells, belong very definitely to the nudist class. As for myself, I promise the reader not to discard my trunks!



## CONTENTS

<i>Chapter</i>	<i>Page</i>
Preface .....	iii
I—The Farthest Limit of Retrospection .....	1
II—The Shuffle of the Genes .....	13
III—Social Adjustments and Maladjustments .....	32
IV—Another Step Eastward .....	42
V—I Acquire a Higher Education—of a Sort .....	52
VI—Adrift on Land and Sea .....	78
VII—New York City and Columbia University .....	89
VIII—An Expensive Fish .....	106
IX—A Teacher of Israel .....	140
X—What I Think of New York .....	152
XI—Summers at the Marine Laboratories .....	155
XII—Woods Hole .....	163
XIII—La Bella Napoli .....	184
XIV—Back Again to California .....	191
XV—A Biological Laboratory That Was Different .....	199
XVI—The Pied Piper of La Jolla .....	210
XVII—Man versus Nature .....	222
XVIII—Why Is a Mouse? .....	232
XIX—Fishes of the Sea—and Some Others .....	248
XX—Reflections on the Real Value of Science .....	257
XXI—The “Vivisection” Bogey .....	266
XXII—The Philosophy of the Booster .....	270
XXIII—Some Frank Comments on What Many Call Religion .....	283
XXIV—Epilogue .....	295



## CHAPTER I

### THE FARTHEST LIMIT OF RETROSPECTION

Where I was born makes little difference. It chances to have been a small town in Connecticut. When memory first dawns, I was living in California, on a place lying within the present limits of the city of Oakland. It was country then and for a long time afterwards. My parents settled there on a ten-acre plot when I was but a few months old, and this was our home till near the end of my tenth year.

In looking back to that period, I pass into a land of strange dreams, which hardly seem to belong to my waking life at all—a realm of shadowy fancies and mysterious half-memories, with occasional clear recollections standing out in relief. Why should such glimpses into the remote past be so deeply tinged with sadness? It is not, in my own case at least, due to any longing for the “good old days,” for my early life was never particularly contented. Indeed, what I longed for as a boy was to grow up and leave behind me the irksome restraints of childhood. For some reason, there is profound pathos in the mere lapse of time: “Long, long ago!” Mark Twain has voiced this feeling eloquently in his peroration on the Sphinx.

We had few neighbors during that period, and these were mainly persons of the small farmer class. My parents had few intimates. There were relatives in Fruitvale, several miles away, and others across the bay in San Francisco. Occasional visits were exchanged, which I remember as distressing events, for I was very shy. Aside from an older brother, I had scarcely any playmates during this entire period of my life.

My father had bought this place with the expectation of doing small-scale farming. He first attempted raising poultry on a commercial scale, but this venture was for some reason unsuccessful. At the time that my recollections begin, only enough fowls for domestic use were kept. He also planted out a small orchard, but soil and water conditions were unfavorable, and I suspect that adequate knowledge of horticulture was also lacking. In any case, the orchard supplied no fruit for our table.

The locality was one of considerable natural beauty. Mount Tamalpais and the Golden Gate lay in the distance to the north, while from our somewhat elevated situation we looked down upon San Francisco Bay, a few miles to the westward, and across to the hills of the Peninsula beyond. Over the fields about a mile to the south, we could see the cupola-topped building of the old "Mills Seminary," now Mills College. The entire neighborhood was hilly, with a range of almost mountainous proportions rising to the east of us. This range was partly wooded, and was deeply grooved with canyons. I recall the feelings of mystery and awe which those distant hilltops called forth in me, particularly in the evening. Hills and mountains, or many of them, have always impressed me as having a certain degree of life. At least, their contours give me at times the illusion of arrested motion. I can remember one of these hills which somehow seemed to wear a distinct expression, though it bore no resemblance to a human countenance. I think that I can understand the naive animism with which our primitive forbears are said to have endowed every aspect of nature.

Unfortunately for the permanence of these fancies, I found, upon revisiting the place after a lapse of nearly thirty years, that the hills had been completely shorn of their mystery through the devastating advances of civilization. The hill with the Sphinx-like expression had become the scene of industrial exploitation, with a hideous

chemical plant spread across its face, and a cavity like the crater of Vesuvius dug into its crown. The one-time country-land, including our own, had given place to a cheap and unattractive suburban residence district of the sort which commonly fringes metropolitan areas everywhere. And the lapse of another thirty years finds the real estate subdivider and road engineer still ruthlessly busy.

To ransack my earliest memories would yield little of interest to anyone but myself. The first events that I can definitely date took place in my sixth year, but I have distinct recollections of happenings which must have occurred several years earlier. Two historic (or at least datable) events which I definitely remember are the assassination of President Garfield in July, 1881, and the death of Charles Darwin in April, 1882. I also recall the great comet of the latter year. I still have in my possession a "newspaper" which I brought out as a seven-year-old editor at the time of Garfield's fight for life. The optimistic report which I prepared on the President's condition runs thus: "Garfield is much better, but his stomach is a little weak."

My recalling the death of Darwin is rather curious, for I had not yet reached the age of eight, and he was scarcely more than a name to me. My father and I were driving home from town and stopped on the way at the house of one of the rural neighbors. This man remarked that he had just read in the paper of Darwin's death. My father replied gravely that he was sorry to hear this, for Darwin was a great man.

Regarding these earliest memories there is always one doubt. Are they primary or secondary memories? Are they true recollections, or merely recollections of recollections? This would be impossible to answer. Nor does it matter much.

Thrown so largely upon our own resources, my brother and I, and—for a while—one of the neighbor's boys used to roam over the nearby hills and paddle in the

brooks and ponds. Birds' nests were raided for their eggs, newts and tadpoles were captured in the pools, and insects everywhere. Needless to say, we made collections. We even took home caterpillars and reared them in a specially made box with a hinged cover set with windowpanes.

Certain animals had a particular fascination for me. If you think these tastes morbid do not say so to a herpetologist! Toads were special pets of mine. Yet more so were snakes, but they were not so easy to obtain. This brings me to my earliest grand tragedy. I had a garter-snake which I carried with me wherever I went. One day I took him to one of my favorite haunts about a mile from home, a place where a large weeping willow tree overhung a small brook. There I encountered a group of boys from town. They noticed the snake which I was carrying and told me to put him on the ground so that they could see him. Suspecting nothing, I did as I was told. Thereupon the boys pelted the snake with stones. I hastily rescued my bruised pet and started away with him. But the boys forced me to put him back upon the ground, and then they promptly finished their devilish work. In response to my heartbroken sobs, they pretended to comfort me and made filthy suggestions as to how I could restore my pet to life. And finally, when I used the only bad language which I had learned up to that time, and called these boys "mean fools," they slapped my face thoroughly.

Dante, I believe, described the torments of some of his enemies as he witnessed them when he visited the Inferno. If I ever make a similar trip, I shall expect to see this group of human devils strapped to stakes and harassed by cobras and rattlesnakes to all eternity. I hope that I shall be able to suppress a wicked smile of satisfaction!

During this period, I collected the usual assortment of shells, birds' eggs, minerals, etc., as well as various objects having a purely fictitious value, such as postage stamps, and stones or other tokens reputed to have come

from one or another place of interest. I hasten to add that this class of objects ceased to interest me quite early in life. (I am tempted to quote Scripture relative to "putting away childish things," though I have a few mentally adult friends who still collect postage stamps.) I think that I devoted the most time to insects. I early learned the stages of metamorphosis of some of the species, partly by actual observation. On one occasion, I inadvertently performed a biological experiment, with rather startling results. I impaled the pupa of a moth upon an insect-pin, without taking further steps to kill it, and put it away in a box, along with some other mounted specimens. Weeks or months later, the moth emerged from the pupa-case, and was found crawling around among its fellow lepidoptera, transfixed through its thorax by the pin.

We dug up ants' nests, and I remember our finding in one of these some curious slug-like creatures which seemed to be living in harmony with the ants. I only learned years later that these were the larvae of certain dipterous flies, and were merely part of a considerable assemblage of parasites and commensals which took advantage of the ant's hospitality. The "velvet ants" (mutilids) were, for some reason, called by us "double-bodied animals," and their capacity to sting viciously was learned by experience. I remember, too, the surprising discovery that certain of the hemiptera can inflict an equally painful sting, but in this case by means of a beak borne upon the head. The "kissing-bugs," as they are now familiarly termed, were henceforth treated with respect. The great, black, slow-moving, flightless beetles of the genus *Eleodes* figure prominently among my earliest recollections, along with the vile smell which they emit when roughly treated. I could chronicle indefinitely such infantile excursions into the field of zoology.

When I was eight or nine years old, I first began to use a shotgun, but never for real game. My ventures as

a nimrod were confined to small birds and the ever-present California ground squirrel. This hunting was not for specimens, however. At this stage, my booty of every sort was prepared for the table. I even remember eating a hawk, properly baked in our oven by my mother.

It was one of the strange incongruities of my father's nature that he allowed me at this early age to use a gun, whereas he was vastly particular that I should avoid far less serious dangers. I must not get my feet wet lest I catch cold, but I could go forth alone with a shotgun at an age when I was altogether incompetent to handle one.

My really keen interest in living things was quite a natural development. Leisure time, an inescapable contact with nature, an older brother and one or two boys in town who had already begun making collections, and a father who encouraged such activities—all this was an environment calculated to turn one's interests in the direction of zoology. That a suitable hereditary "reaction-system" was equally necessary need hardly be said, to anyone at least except a "behaviorist." However, I doubt whether one's hereditary mental endowment determines very specific preferences for this or that branch of knowledge. Aside from my primary environmental bias toward biology, I see no reason why I should not have entered any field of inquiry calling for natural curiosity and for fairly well developed powers of observation and reflection. Indeed, somewhat later in my boyhood, I did more than once come near specializing in some other field before finally making an abiding decision.

Although my father had a profound respect for science and the scientists, and read many books by writers such as Spencer and Fiske, who endeavored to distill the essence of scientific knowledge for the general reader, he was himself surprisingly uninformed regarding even the elements of most of the sciences. Air, he believed, was composed of "oxygen, hydrogen and carbonic acid gas,"

and the same formula, if I remember correctly, served for water. His information in the biological sciences was equally fragmentary and inaccurate.

Certain juvenile books on natural science were, however, given me during this period by my parents and by some of my eastern relatives. Among these I recall Arabella Buckley's "Life and Her Children," Duncan's "Transformations of Insects," with its exceptionally fine illustrations (really a translation from the French of Blanchard), McCook's "Tenants of an Old Farm," and Charles Kingsley's "Madam How and Lady Why." Kingsley's allegorical account of the earth's geological history proved to be so vivid at one point as to give me something of a scare. He told of the first historic eruption of Vesuvius, and how the ashes had been carried high in the air and transported long distances. Shortly after reading this, I watched a cloud which was gathering over Mount Tamalpais and spreading across the sky in our direction. I recall bringing out a glass from the house and setting it in an open place to catch a sample of the ashes which I believed to be about to fall on us.

Later, a compound microscope was given us by one of our relatives, and this was a source of much interest for a while. Today the scent of Canada balsam is still strongly reminiscent of those early days as a microscopist.

During this California period of nearly ten years, I never attended school. My brother and I received daily lessons from our father, which included, besides the "three R's," geography (taught from his own text), and I believe some United States history. The drilling was well done, and I was, in consequence, able to enter school one or two grades ahead of most boys of my age. I recall also that Father forced us to commit to memory a few poems. This task was only performed under compulsion, since for some reason poetry seemed to us quite nonsensical and unworthy of a serious person's attention. We ridiculed it as freely

as we dared, and I remember being severely punished for one such misdemeanor. At this time, poetry and indeed anything "sentimental," including any display of affections, were thrown together, along with crying, under a common taboo, as not being "manly." How this mental kink originated I cannot say. It dates back to an early period of my boyhood and some of its effects have persisted throughout my life. I have no feeling of repugnance at present toward poetry in general, and am capable of experiencing genuine thrills from occasional examples. Shelley's fourteen-line gem, "Ozymandias," for example, calls forth far-reaching reverberations. However, I must admit that most poetry bores me, regardless of the celebrity of the poem or its author. Much of it, indeed, I find downright irritating, particularly the productions of the so-called "modern" school (or schools), which studiously avoid direct or intelligible utterances on any subject, or which affect a contempt for rhyme, rhythm or any of the recognized poetical forms. (The same goes, *mutatis mutandis*, for the equally psychopathic recent trends in the realm of art!)

We never received religious instruction nor lessons from the Bible, though I recall "Pilgrim's Progress" being read aloud to us by our mother. My parents called themselves Unitarians, but no church of this denomination was within reach of our home. I have only one recollection of being taken inside of a church during this period of my life. My father believed in a creator, but not in the biblical account of creation. Sunday was to us like any other day. We had some "pious" relatives in town, in whose presence we had to be circumspect. One of these was a venerable clergyman, who asked divine blessing at meals. The first time that I witnessed this unfamiliar performance, it is said that I scandalized the family by asking in very audible tones: "What is that man saying to his plate?"

I regard it as very fortunate that I was not handicapped by early training in the then prevalent religious

dogmas. Literature contains various accounts of the painful process of disillusionment which frequently came about when a Bible-bred child of intelligence reached the age when he began to think for himself. And the era of such mental and moral crises is probably by no means past. In cases where moral conduct is given the status of a mere tail to a theological kite, the disillusionment must sometimes end in tragedy. The revivalist who paints the dire consequences of "loss of faith" is perhaps not always indulging in fiction, though the lesson which he draws is not the correct one. Quite the contrary. Principles of right and wrong should not be bound up inextricably with an outworn system of theology, to go down in ruin when the latter collapses. If the present generation of youth has really drifted into moral laxity, as is so often stated, I think that we can point with little hesitation to one of the factors responsible.

My own early moral training was on a high level, so far as precept was concerned, even though vacillating and sometimes unwise enforcement of the rules of conduct tended to offset the benefits of such training. One salutary lesson in honesty is still prominent among my recollections. I was severely rebuked by my parents for taking home, without permission, a few seeds from a plant in a neighbor's garden. In consequence I had to go through the mortifying ordeal of returning the seeds with an apology. As a result of such home influences, I think that I began life with more rigid standards of honesty than many of the boys with whom I was thrown later.

Many studies have been made by psychologists of the fears of childhood. Throughout this early California period, and I think somewhat longer, there was one group of objects which filled me with unspeakable horror. I refer to dead animals. Not all animals, but only certain mammals, particularly cats and dogs. To suddenly encounter a dead cat or dog would fill me with terror, and, if alone,

I would run long distances to escape from it. The recollection of one of these dead animals would haunt me for days. I would carry with me everywhere the hideous grin of the bared teeth and the ghastly expression of the terrible dead eyes. At night these memories were particularly keen, and I developed a most abject fear of the dark. In bed, I would cover my head with the bedding to shield myself from these spectres. Not that I ever saw one, or imagined it, but I momentarily feared that I might do so.

These fears were among the most distressing experiences of my childhood. And indeed, my fear of the dark has persisted to the present day. It is no longer associated in any way with dead animals, and it is but slightly manifested out-of-doors. I have often travelled alone after dark, and even slept beneath the sky, with little or no dread. It is indoors that the old phobia takes possession of me. Every house is haunted, when I am alone in it at night, and I momentarily await the appearance of a spectre of some sort. This feeling, to be sure, is seldom pronounced enough to cause me much discomfort, though it is at times a source of real distress. I rarely allow it to influence my actions, and I naturally do not reveal it to others.

Curiously enough, I still, at times, cling to my old trick of covering my head with my bedding, or at least with a sheet. When sleeping entirely alone in a house, or when in a state of dread, after waking from a nightmare, covering the head seems to shut out some dire influence. A strange element of the situation is the fact that, within certain limits, a heavy covering is found to be more effective insulation against the dreaded presence than a thin layer. In extreme cases, a blanket has to be used. (Here we have possibilities of dealing with this phenomenon quantitatively!) A breathing aperture must, of course, be left for the nose, an organ which fortunately seems to be relatively insensible to the spectral influence.

It is of interest that the hallucinations which I anticipate on these occasions (but have never experienced) are tactile as well as visual; but how the interposition of such a screen could effect either is hardly comprehensible. The action would seem to have a purely instinctive basis, with its nearest analogue in the scrambling of a frightened animal for cover. I believe that the practice of covering the head at night is not rare among children. I wonder how many persons have carried such marked traces of this habit through life.

Another curious phobia which I displayed in early childhood was a dread of music. I may remark parenthetically that this was before the days of jazz! I would begin to cry upon hearing an instrument played, not at all in the way that one is sometimes moved to tears by music, but because of some unexplained antipathy. An instance which stands out in my memory was the starting of an automatic musical machine, while we were eating in the dining room of the old Woodward's Gardens in San Francisco. I promptly began to bawl. No such dread of music has persisted in my mature life. It is probably one of those cases, so dear to the "psychoanalyst," in which the effects of some painful experience have outlived any recollection of the experience itself.

We may, I trust, accept this obvious interpretation of such facts without adopting the ideology or vocabulary of the Freudian school. I am certain that I can detect among my own early recollections nothing remotely suggestive of "infantile sexuality," least of all of an "Oedipus complex." Perhaps if subjected to sufficiently protracted "analysis" by a skillful practitioner, I might conjure up various phantasies of the sort which were expected of me. And upon these, there could doubtless be erected an ingenious system of interpretations, not only of these phobias of mine, but of every point in which I deviate from sup-

posed normality. That such speculations would have any scientific significance I very seriously doubt, and this doubt remains after a conscientious attempt to familiarize myself with some of the evidence as set forth in several volumes by leading psychoanalysts, including one by Freud himself.

## CHAPTER II

### THE SHUFFLE OF THE GENES

I now pass to perhaps the most difficult part of this undertaking, an attempt to evaluate the role played by nature and nurture in determining my personal characteristics. It will be necessary to discuss very frankly the peculiarities of my parents, and both of my parents abounded in peculiarities. However, I shall be no more merciless in portraying these than I shall be in portraying my own.

Before proceeding with the analysis of my father, I must first acknowledge my heavy debt of gratitude to him. He encouraged my early inclinations toward a scientific career, and was continuously ambitious for my success. He gave me home instruction in the various elementary branches through my tenth year, so that when I first entered school at that time, I was well in advance of most boys of my age. Despite his limited means, he made it possible for me to complete a college course. When not displeased by real or imaginary misconduct on my part, he treated me kindly and often even affectionately.

But his moods were subject to violent fluctuations. He was immensely disturbed by any manifestations of ingratitude or unfilial conduct on the part of his children, and meted out severe chastisements, both verbal and corporeal. These were frequently accompanied by considerable loss of temper on Father's part, often, it seemed to me, with very little provocation. Affronts to his dignity, such as I now expect as a matter of course from my own son—and do not resent—were apt to meet with stern rebuke.

I recall that one early friend of Father's wrote to Mother at the time of his death that Father was a man of high ideals, but was poorly equipped for the battle of life.

This was certainly true. He was a man of scholarly tastes, with the highest standards of honesty and personal decency, with a genuine admiration for the finer traits of human character, a lover of the beautiful, fond of children, particularly of little girls; but indisposed, throughout a considerable period of his life, to engage in any serious occupation, and unable to maintain harmony in his own home. The last is said with full realization of causes contributory to this failure, including serious shortcomings on the part of his children.

In spite of his intermittent displays of firmness in dealing with his family, my father was far from being a forceful character. That such weakness had some physical basis need hardly be said, and other visible manifestations of physical inferiority were not lacking. He was not at all athletic, was extremely nearsighted, and suffered from various minor ailments to which he attached undue importance. At one time during his earlier life, he accepted the verdict of a presumably incompetent oculist that he would shortly become blind. In consequence, he spent a long period—some months, if I am not mistaken—in a darkened room. However, this alarm appears to have had little foundation, for he did an exceptional amount of reading throughout the years that I knew him, and he showed no signs of failing vision up to the time of his death at the age of seventy-one.

To my father, it would seem, the people of the world belonged to two very definite classes, the "good" and the "bad." His disposition was naturally charitable, and persons were placed in the "good" class until they forfeited his confidence; thereafter they belonged to the "bad." The statements of anyone not known to be "bad," if plausibly presented, and uttered with conviction, were likely to be accepted without question. Any doubts expressed by his family were apt to be hotly resented. "You don't suppose the man would lie, do you?" was a characteristic rejoinder.

At one time he had a set of lightning rods installed upon his house, following the visit of a plausible agent, only to have them taken down again when he was informed by someone else that the outfit was worse than useless. I well remember the visit of the salesman who was responsible for this last purchase. He came equipped with one of the lightning-rod points, a section of the conductor, and a small magnetolectric machine. The "prospect" was given a pair of handles to hold, and a distressing shock was administered when the salesman turned the crank of the machine. The two wires leading to the handles were then short-circuited by laying across them a section of the lightning rod. No more shock. *Q.E.D!* Even I, then in my early teens, had picked up enough knowledge of electricity to realize that there was a joker here. And yet in many ways my father's mental capacity was well above the average.

On the other side of the picture, his distrust of politicians and some other classes of people was unbounded. He was a devoted reader of the "Nation," in the days of E. L. Godkin, and he accepted that gloomy journalist's portrayal of American political life without reservation. Though a poor man most of his life, his sympathies in general were aristocratic, and he scorned the ignorant masses, whom he was accustomed to refer to as "the rabble." Naturally, he was apprehensive of the growing labor movement and the "agitators" who were busy promoting it. The American experiment in democracy he believed to be a thoroughgoing failure. The political system of England, royalty and nobility included, he regarded as the best in the world. Yet he sincerely disclaimed snobbishness, so far as this was based upon wealth.

During my boyhood and up to the time of his death, my father had no profession. His small income was derived chiefly from a bequest from one of his brothers, supplemented by an allowance from other relatives who had

been more fortunate than he financially. He had written textbooks in geography which, I believe, had been moderately successful earlier, but which yielded small and diminishing royalties during my boyhood. I know altogether too little regarding Father's early life. He had had good schooling, but had not attended college, owing, I believe, to his weak eyes. As a boy, he attended school for one year at the historic Brook Farm Colony. So far as I know, his only profession in later life was that of teacher. The last such position which he held was that of principal in a school for Negroes in Charleston, South Carolina, maintained by the Freedman's Bureau of Boston. Before that, during the Civil War, he volunteered, with several other Boston men, to teach emancipated Negro slaves in Southern territory which was only insecurely held by Northern troops. This, we may believe, required some courage.

My father's chief serious occupation during most of my boyhood and youth was reading. He was an ardent, though not very critical follower of Herbert Spencer and John Fiske, to whose works he devoted much of his time, and whom he frequently quoted to his family.

Contrasting with his rather conspicuous lack of visible achievement, my father displayed not infrequently an air of conscious mental superiority. When my earliest recollections commence, he was already an elderly man. From the first time that I had the opportunity to compare him with other men, I recognized him as being peculiar. And my boy companions so regarded him. He was slow of speech, meticulously finishing each word before commencing the next. He employed a rather stilted vocabulary, even when conversing with uneducated persons; he used the "broad a" for a large variety of words, and clung to various other peculiarities of diction and pronunciation, already regarded as archaic. The importance of correct pronunciation, as he conceived it, was so overwhelmingly

great to him that he would halt any member of the family in the middle of a sentence to point out a supposed error, no matter how serious the topic of conversation. However unconsciously, he gave the impression of being pompous and didactic. The effect of such idiosyncracies amid the early crudities of the Far West may be readily imagined.

Be that as it may, Father was far from being devoid of all sense of humor. Quite the contrary, he enjoyed in a high degree such nonsense as that of Mark Twain and Lewis Carroll, and was even considerable of a joker himself in a ponderous sort of way.

My father's appearance was no less arresting than his manner of speech. He seldom dressed in the style of the day, and he wore very thick glasses, invariably covered, when out-of-doors, by deeply tinted spectacles. On the streets, he walked slowly and very erect, looking straight ahead, except when he paused to direct a rather fixed stare at some person or thing. He rarely accosted anyone, except when spoken to first. Though he strove to avoid anything which might compromise his dignity, he lacked poise and tact, and his words and actions were often highly malapropos. On the whole, he was a pathetic figure. To many, I fear, he seemed a ridiculous one.

These are my own recollections of my father, and I do not think that they do him injustice, so far as they go. But these later years, represented, I suspect, a period of declining mental and moral vigor. I know that in his earlier life he did not lack good friends, and that he even seems to have had a few warm admirers among discriminating persons. One of these last, a man of exceptional character and attainments, will figure later in the present narrative. A few of my father's early letters to him, which I now possess, reveal an abundance of genuine humor, as well as an unaffected buoyancy of spirit which he rarely betrayed in later life.

I face a yet more difficult task in attempting to sketch a truthful portrait of my mother. Whereas my father died more than forty-five years ago, so that hardly any remain who knew him, my mother lived until much more recently. Memories of her are still vivid to her family and friends. However, without such a portrayal, this biographical sketch would be altogether incomplete.

If my father was a pathetic figure, my mother was even more so. Like him, she was ill-adjusted to the world she lived in. Like him, she had the best of intentions, but was deficient both in practical wisdom and force of character. But she was in many ways the exact opposite of my father. Whereas he was slothful, she was energetic. He was timorous and constantly apprehensive of illness; she faced life far more courageously. He was studious and reflective; her interests were altogether concrete. His actions, much more than hers, were based on rational motives; she was largely motivated by sentiment or prejudice, sometimes merely by unaccountable whims. He was frequently credulous to the point of gullibility; she was more likely to be suspicious of other persons. Their standards of truthfulness were also very different. My father was scrupulous in conforming his statements to fact, so far as it was known to him. Scientific accuracy was his ideal. My mother's notions of truth were more subjective. What was true for her was more apt to be what she wanted to believe. Scientific accuracy was something quite foreign to her mental make-up.

My mother was essentially generous, even to the point of self-sacrifice. This and her unaffected cordiality toward those whom she liked won her some warm friends, particularly late in her life, when her personal oddities were easily attributed to advancing years. In curious contrast to this, she tended to be jealous and unduly suspicious of the motives of others. She cherished resentments with great tenacity, and was given to rehearsing long past grievances with undiminished rancour.

Intellectually, my father was my mother's superior in every way. He was, on the whole, a logical thinker, with a thirst for knowledge which was genuine, and a real interest in some of the deeper problems of life. In comparison, her mental processes were superficial, at times even childish. Of this she must have had a subconscious awareness. Though she frequently expressed her opinions with emphasis, her tones tended to be faltering as if lacking in conviction. Throughout her life, she seems to have been the victim of repression.

On the other hand, it was my mother who kept the family going. It was she who performed the domestic drudgery, and these duties were never neglected, however weary she might feel. Indeed, she quite needlessly increased her burdens and performed many tasks which were utterly uncalled for. She felt that her labors were not properly appreciated by her husband or her children, and I am afraid that she was right in this belief.

It could hardly be expected that such an ill-mated couple should lead a harmonious life, and indeed they did not. Domestic friction looms large among the earliest recollections of my childhood. My father would ridicule my mother's whimsical opinions and unreasoning actions; she, in turn, would berate him for his slothfulness and impracticality. They were frequently at odds over their policy in dealing with the children. He was more often sternly enforcing obedience and punishing infractions; she was more likely to favor lenience and forgiveness.

All these dissensions were carried on freely in the presence of us children and, if it so chanced, in the presence of guests. To this discord, it must be said, we children ourselves contributed our full share. It would be futile now to endeavor to apportion the blame for the situation. What, after all, is blame? For present purposes, it is sufficient to record that this unfortunate situation existed and that it had a profound and lasting effect upon the

writer of these memoirs. Domestic discord, and my parents' manifold oddities of behavior towards guests, made it more and more difficult for me to bring any of my young friends into my home, and this added greatly to the social isolation to which I was subjected throughout most of my boyhood and youth. These circumstances should afford a sufficient explanation of my secretiveness regarding my own family and home, which must have impressed most of those who knew me.

The foregoing account of my early life should also make it plain why I grew up with very little of the normal sentiments of affection toward my parents and home. The profound feelings of love and gratitude which are called forth in the normally reared son by the words father and mother are almost wholly beyond the pale of my experience. And yet my parents, I doubt not, did on the whole what they believed best for me, and they were greatly disappointed at times by my reaction to their efforts. From my early childhood, I recall being told on occasions that I was an ingrate and an unnatural son. If that condition became a reality, I believe that this frequent reproach was itself in part responsible. The lack of any great degree of respect or affection for my parents I could not altogether conceal from them, and I made no great effort to do so. The familiar expressions of filial affection were abandoned before the close of my boyhood.

In her later life, my mother was somewhat awed, I believe, by my very moderate scientific and literary achievements, and she greatly over-estimated my capacity in these directions. Yet she seemed unable to form the most elementary notion of the motives underlying the work of a scientific man. That one should consent to work in a research position for a rather meager salary, when he might achieve a far more liberal income in some other profession, seemed to her, I believe, an indication of sheer perversity. Then too, any forthright expressions of opinion which

might conflict with the views of influential persons she regarded as highly indiscreet. My negative views regarding religion and "prohibition," for example, while by no means shocking to her personally, ought, she believed, to have been kept rigidly to myself.

All in all, Mother and I had scarcely any common ground to stand upon. Our conversations too often ended in quite futile arguments, in which both of us might lose our tempers. And yet she was frequently generous with her gifts, of which I was sometimes a rather unwilling recipient. Despite her extreme fluctuations of mood, and her frequent attitude of reproach, I think that she retained to the end a certain degree of affection for me. It doubtless would have been greater could I have given more in return, but the causes of my failure to do so date back to my earliest environment, possibly in part to the germ-cells from which I developed.

I have referred earlier in this narrative to "us children." There were three of us. One was a sister six years younger than I. She was the crowning tragedy of my parents' married life. She was distinctly psychopathic, though I do not know exactly how she would have been rated by a psychiatrist. Such an opinion was never obtained. As a child she was odd and below normal in intelligence. She remained somewhat undeveloped physically, and never fully matured mentally, though she lived to the age of twenty-three.

My sister early displayed a strong antagonism towards both of her brothers. This was not surprising, since we never showed her much sympathy, and were disposed to ridicule her peculiarities, which seemed to us at the time to spring from stubbornness and perversity rather than from defective intelligence. Later this antagonism extended to her father, who had been devoted to her as a child.

Her backwardness in school, her lack of friends, and her general social maladjustment served to accentuate these

inborn peculiarities. Though never actually insane, as I understand the word, she had pronounced obsessions, and was often moved by a spirit of contrariness to do the exact opposite of what she saw others doing. This was shown in a marked degree in her dress.

More and more, she withdrew from contact with her family and relatives, her only remnant of affection being reserved for her mother. She became increasingly self-absorbed and depressed. The end was inevitable. At the age of twenty-three, after two previous attempts, she took her own life.

It would be out of place here to discuss my brother, who was still living less than a year ago, and was well known to numerous friends and acquaintances. I may say that in some of our individual peculiarities we agreed fairly closely, enough to establish a quite perceptible "family resemblance." This resemblance, I believe, was both genetic and environmental in origin. We agreed in certain of our characteristic viewpoints and reactions to life, both with one another and with my father. This last fact is the more significant, since we were not greatly disposed to copy our father during his lifetime. On the contrary, we were more apt to be moved by a spirit of antagonism toward him.

On the other hand, my brother and I differed rather widely in some other respects. One class of facts which the environmentalist account of human character is least competent to explain is that of family differences. Children of approximately the same age, brought up in the same home, with similar outside contacts (or lack of them), often display, none the less, striking mental and physical differences. Such cases are quite intelligible when we consider that children of the same parents very rarely have the same hereditary endowments, and frequently have very different ones. Heredity does not require that offspring should closely resemble their parents, nor that

brothers should closely resemble one another, though it is true that such resemblances are a frequent result of heredity. On the other hand, we may derive through inheritance characteristics which were never known to be manifested by any ancestor in our entire descent line. This, to a geneticist, is of course, a mere platitude.

I shall not devote much time to the interminable controversy respecting the relative importance of heredity and early environment in determining human character. To begin with, the question itself, as frequently formulated, is absurd. Which are more important in the construction of a house, the carpenters or the building materials? Of course they are both essential and equally so. But it is fair to ask which of the two factors (heredity or environment) is chiefly responsible for the *differences* which we find between one man and another. The truth doubtless lies somewhere between the two extreme positions which have been taken. Few biologists would now accept the contentions of the earlier Mendelian enthusiasts, who endeavored to base complex traits of human character upon single unit-factors of heredity. And few, if any, would accept the still more amazing contentions of the leader of the so-called "behavioristic" cult, who some years ago asserted:

"Give me a dozen healthy infants, well-formed, and my own specific world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of [the] talents, penchants, tendencies, abilities, vocations, and race of his ancestors." (J. B. Watson, *Behaviorism*, 1924, p. 82.)

The evidence for the inheritance of individual mental differences has long since become convincing to anyone whose judgment has not been warped by preconceptions. On the other hand, there is equally convincing evidence

that differences of early environment may induce mental differences between persons supposedly identical in hereditary endowment. The familiar case of identical twins, long used as an argument for the overwhelming importance of hereditary likenesses and unlikenesses, as compared with environmentally induced ones, has likewise been found to furnish some arguments on the other side. While it is true that such twins agree much more closely, mentally and physically, than ordinary brothers or sisters, or even than twins of the more frequent type, it has been found that when reared apart in very different households, identical twins may develop considerable differences which can only be attributed to environment.\*

All in all, it will probably never be possible to disentangle the parts played by intrinsic and extrinsic factors in determining the mental make-up of an individual. We may feel confident that differences in general intelligence and in some special aptitudes, such as musical ability, depend primarily upon hereditary factors, while manners, habits of speech and the like may be attributed, with equal confidence, to "bringing up." But what about such characters as selfishness and unselfishness, honesty and dishonesty, courage and cowardice, pessimism and optimism, credulity and skepticism, and the whole range of characteristics included under the head of "temperament"?

Goethe's lines, setting forth the respective contributions of his parents, have often been quoted:

Vom Vater hat ich die Statur,  
Des Lebens ernstes Führen;  
Vom Mütterchen die Frohnatur  
Und Lust zu fabulieren.

But we are not told to what extent these characteristics of Goethe's were derived through the channels of organic heredity, and how much through postnatal influences, exerted during infancy and later.

\* H. H. Newman: "Multiple Human Births," New York, 1940.

No reader of the present narrative who knows the writer can have failed to note points of special resemblance between myself and my father as I have described him. These common traits comprise elements both of strength and of weakness. I have my father's love of intellectual pursuits, and interest in the riddle of the universe. I have, on the whole, his standards of honesty and his fairly consistent adherence to truth, including his propensity to blurt out the truth, whether this is in place or not. I have his preference for simplicity, and disgust with social conventions, his refusal to be guided in his actions by what someone else might think of him, his scorn of bigness as a measure of success. Indeed, I find myself today agreeing with some of my father's opinions which either made little impression upon me during his life or which I then actually rejected.

I share to a considerable degree, too, his "impracticality" in the business realm, his lack of sufficient driving force to achieve a degree of success proportionate to his mental ability, his pessimism, his lack of courage in facing the major issues of life. Like him, I am slow in my actions, and incapable of quick thinking in emergency. Like him, I write well but talk poorly. Like him, I lack any considerable degree of creative imagination. My father gave the impression of self-satisfaction and vanity. To judge from my own experience, I think it probable that these appearances were partly deceptive, and that they overlay a profound realization of his own inadequacy.

To what extent these various points are *bona fide* instances of the operation of heredity, and how far they are attributable to early environment, I cannot say with certainty. I have long held the personal conviction that my distinguishing peculiarities are chiefly hereditary in origin. But for this belief I can offer no scientific proof, and my opinion on the subject is perhaps worth little more than that of one who has never given special atten-

tion to the problems of heredity. That the characteristics in questions are derived from my parents, through one or both channels, is of course beyond question, so that this account of family traits must be regarded as relevant.

One rather curious point of psychophysical resemblance between my father and myself deserves mention. My father found it very difficult to recognize faces. He rarely spoke to an acquaintance upon the street unless first spoken to. He continued to ask the names of my boy companions whom I brought to the house, even after meeting them many times. My father himself attributed this fact to his nearsightedness, and this was, without a doubt, a contributing factor. But I much doubt whether it was the chief cause. With the aid of glasses, he saw reasonably well, at least at short distances.

It is of considerable interest that whereas my own vision, when corrected by proper lenses, is well above the average, I display this same inability to recognize faces. This defect manifested itself early in my boyhood. It has been, throughout my life, a serious handicap, and has been the frequent cause of embarrassment and mortification. Unless I encounter a person frequently, I commonly fail to recognize him when I do so, and to some persons (more often women) I must be introduced again and again. Their faces are very slow in recording themselves. It is not that I forget the person, or in most cases even his name. I simply fail to remember how he looks, and this despite my habit of watching a person's face while talking with him.

There is, however, no absolute consistency in this matter. Occasional individuals I learn to place fairly promptly. Such inconsistencies make it difficult for other persons to accept without question my apologetic explanation that "I do not recognize faces well," particularly when it is known that I recognize my plant and animal acquaintances with considerable facility. The whole thing is a puzzle to me.

One explanation lies ready at hand. A college executive, well known for his miscibility and his postprandial eloquence, sagely advised me on one occasion that I would learn to recognize my students if I took sufficient interest in them. He went on to say that he had been to some social affair the evening before and met some hundred persons (I trust that I do not exaggerate the number). He was confident that he would be able to recognize any one of these persons should he meet him again. He might have added that no one ever succeeded in politics without having this faculty in good measure. However, the fact that I am frequently unable to recognize the faces of persons of whom I think highly, and whom I particularly wish to please, makes it certain that lack of interest is not the main basis of the difficulty.

I have said nothing thus far of inheritance from my mother's line. I find it difficult, if not impossible, to detect any specific points of resemblance, unless we include a considerable fondness for gardening and flowers, a thing which can hardly be attributed to heredity. I resemble her in various ways, to be sure, but these do not include my most characteristic traits, that is to say, those traits which distinguish me from the average. On the other hand, the points of difference are too numerous to mention.

I can say little of the generations of ancestors back of my immediate parents. When available, such data are doubtless highly interesting in some cases, though as commonly employed, I believe that they throw little light upon the subject of a biography. How often does such a narrative begin with remarks upon the alleged exploits or characteristics of some forebear of the fifth or sixth or some earlier generation of ascendants—always in the line carrying the paternal name! That there is little relevance in such information—even when accurate—is evident when we consider the small contribution of any one member of the sixth ancestral generation to the heredi-

tary make-up of an individual. We receive, on the average, only one sixty-fourth of our heritage from such an ancestor. In the absence of consanguineous matings, this represents the chance that any particular hereditary "gene," derived from that ancestor, will find its way to a given descendant. To ignore the other sixty-three ancestors of this generation may be allowable in heraldry, but it has no warrant in science or in ordinary common sense. Exceptional cases may be cited which seem to contradict these statements, but their general truth is beyond dispute.

I have far more information regarding my father's family than my mother's. Even so, the record is meager. Although on both sides my ancestry appears to have been predominantly English, there is one very different strain which deserves mention because of its romantic appeal. Family tradition tells of an Italian official named Bertoldi, who married a native Persian, while stationed at Ispahan. Their son was educated at Padua, and became physician to Louis XVI of France. He came to America at the time of the French Revolution, and married Ursula Plimpton, the mother of my paternal grandmother. I have seen a miniature portrait of the "Persian great-grandmother," and have no reason to doubt that family tradition is essentially correct in this matter. It was even insisted by Mr. E. W. Scripps, ordinarily a keen judge of men, that I showed in my features plain evidence of the Persian ancestry. I must add, however, that to my knowledge no one else has detected such characteristics in any member of our family.

My paternal grandfather was a Boston lawyer. He was a man of sufficient prominence to be a candidate of one of the major political parties (unsuccessful, to be sure) both for the mayoralty of Boston and for Congress. (This was before the days when the Irish Catholics controlled the political life of Boston.)

My father's rather numerous brothers and sisters were persons of more than average culture. One of my first cousins, who was in much closer contact with the family than I, writes: "On the whole, our common ancestors have shown strong constitutions physically, good intelligent minds, considerable talent in the way of music, art, and literature, and a great deal of beauty." However, neither my father nor any of his children have exhibited any trace of musical or artistic ability. As regards myself, I have always freely granted that I am a "musical imbecile," albeit I am capable of deriving real thrills from some music, provided the melody is simple and it has become sufficiently familiar through repetition. Only one of my three uncles, so far as I know, attained any considerable success in business or professional life, or acquired even a moderate fortune.

Regarding my mother's parents or ancestors I have been able to learn very little of a definite nature. Both of her parents died when she was a child, leaving her to be brought up by an aunt. She came from English stock, which had settled in New England, and had been a teacher in the school at Charleston, under the direction of my father.

It might seem that questions of heredity should have nothing to do with the judgments which the world passes upon us. A man of high character and ability is valuable for what he is, and few would be interested, we might suppose, in knowing how far his superiority was germinal and how far it was the result of a fortunate combination of opportunities. Likewise a vile or depraved person is loathed, regardless of whether he sprang from criminal stock, or was debased by a sordid environment and vicious companions. We are what we are, and we are likely to be weighed on that basis alone, regardless of the parts played by nature and nurture in the outcome. Nevertheless, we frequently hear special pleas offered on behalf

of a criminal, on the ground that his early surroundings had been bad, and that he could not be expected to know better. Curiously enough, we hear similar appeals for sympathy on precisely the opposite ground, that the culprit was a victim of bad heredity, and had commenced life with an unfair handicap.

Now it must be conceded that "before the throne of God"—if anyone still believes in that venerable piece of celestial furniture—both of these pleas should stand on the same footing. The individual is the resultant of two sets of factors and two only: his inherited potentialities and the circumstances which molded these from birth onward. In only a limited sense does he create either himself or his environment. So far as he creates these at all his choice at any one moment depends upon his reaction pattern at that particular moment. And this, in turn, depends upon his hereditary endowment, interacting with previous environmental situations, back to the earliest voluntary decision which he ever made. Any effort to introduce some indefinable, non-causal agency into the picture, such as the attempted application to human life of the so-called "uncertainty principle" of recent transcendental physics, would seem to be not only unscientific, but quite valueless from the ethical standpoint.

It is often thrown out as a reproach to one who has gone wrong that he could have done differently "if he had only tried." Quite so. Also iron would have been much heavier, if it had only been lead, and starch would have been much sweeter, if it had only been sugar! Is there really no difference among these cases? Yes, there is one. No amount of pleading could turn iron into lead, nor could pleading turn starch into sugar. But the hesitating wrongdoer may sometimes be deterred by entreaty. With this additional (but purely natural) stimulus, he may try so hard as to make a different decision.

When we have freed ourselves from theological prejudices, judgments of right and wrong must be recognized as having a purely social significance. Praise and blame, reward and punishment, are agencies by which society coerces the individual into conformity with its standards. It is for this reason that the plea of "bad environment," when offered in an appeal for court clemency, would seem far more worthy of heed than "bad heredity." The outlook for undoing, by proper treatment, the effects of faulty environment seems far more promising than the outlook for repairing a hereditary defect.

## CHAPTER III

### SOCIAL ADJUSTMENTS AND MALADJUSTMENTS

After nearly ten years of life on the California farm, our family began its return trek eastward, a journey which was to take another ten years, with two long stops on the way. The first move was to Colorado Springs.

The reasons for leaving the California home are mostly obvious. The isolation became more and more intolerable to my parents, particularly after a breach occurred in the friendly relations with our nearest neighbors. There were no schools near at hand, and the education of us children was to my father a consideration of supreme importance. Then too, he had become convinced that we needed a drier climate. I, in particular, had spells of hoarseness, which were diagnosed by a throat specialist as due to "chronic laryngitis." (I prized this at the time as a rare accomplishment!) My father was convinced that I had inherited his weak throat, and that the coastal fogs did not provide a proper climate for me. And so the little house and ten-acre plot were sold for considerably less than they had cost, and the train was boarded for Colorado. This was in May, 1884.

The choice of our next home was the outcome of a characteristic blending of excellent intentions and poor judgment on the part of my parents. Colorado Springs at that time was only a village of some 2,500 inhabitants. It was made up, to a large extent, of two classes of people: well-to-do "lungers" and their families from this country and Europe, and the tradespeople and others who catered to their needs. It was a curious mixture of eastern and English snobbery with the crudity of the still somewhat wild west.

My father was chiefly influenced in his selection of this community by two circumstances: its reputation as a health resort, favorable to the supposed infirmities of his family, and the existence there of a college, Colorado College. However, at the time of our sojourn in Colorado Springs in the eighties, this last was a very unimportant institution. The greater part of the small body of students were in the preparatory department, which was only of high-school rank. The number of collegiate students was insignificant.

In Colorado Springs, I was for the first time really brought into contact with other boys, not one or two at a time, on rare occasions, but numbers of them, living as close neighbors on every hand. Our parents had decided in advance that we boys should associate only with "gentlemen's sons." But this was one of that large class of schemes which "gang agley." Owing to the situation of our first temporary abode in the town, we were thrown at the outset chiefly with boys of the public school set. We naturally came to associate with such companions as were available. And these comprised samples of nearly every type. There was, for example, a hunchback Negro boy, known to his white associates as "Coonie." I recall vividly his brisk, swinging gait, and the backward tilt of his head as he strode along the streets, whistling Sousa's "Washington Post March." However, not many of my companions were Negroes. There was a minister's son, with whom I was chummy for a while. I remember his taking me into his father's church, on one occasion when it was empty, and amusing himself (and me) by opening up the hymnbooks, one after another, and spraying them with a richly colored mixture of saliva and cloves. It was this same boy whose father threw me over the fence when I chased Junior into the yard of his home in the course of a quarrel. And then there was another minister's grandson, a big fellow with a deep voice, who was

one of the first from whom I learned "smutty stories." The grandfather, be it said, was rigidly pious, and would not allow his ward to play with the other boys on Sundays.

Nevertheless, they were not a vicious set of boys, on the whole, and the ones that I had most to do with were fairly harmless. They used bad language, to be sure, and they were not always scrupulously truthful when they disobeyed parental instructions. Sometimes they (I mean we) bought a package of cigarettes, and sneaked off somewhere and smoked them. But it takes more than that to make a really bad boy. To my father, on the other hand, every boy was lily white until he had given definite evidence to the contrary; after that, he was altogether bad.

It must be said that I found it difficult to adjust myself to these boys, and indeed I never altogether succeeded in doing so. I was slow in my reactions and consequently awkward in games; I walked with a peculiar up-and-down movement, which earned me the sobriquet of "Bouncing Dutchman"; and worse yet, I spoke a quite different language from the boys of the town. I knew little of the slang of the day; I employed words which they regarded as several syllables too long; and I pronounced them as my father had learned to pronounce them in Boston fifty years earlier. Worst of all, I didn't know many of the things which boys were supposed to know, and the things which I did know did me no credit. At least, that was their verdict. Being thus unlike the other boys, I was of course queer, if not indeed mentally defective. I began to accept this verdict myself. What a fine beginning for an "inferiority complex!"

In view of these circumstances, it was a source of surprise to me, in the fall following our arrival, to find myself entering school at a more advanced grade than most of the public school boys of the same age. And these boys, for their part, naturally accepted the situation with ill grace. It was a source of further surprise that I kept well in the front ranks in my studies.

My first school was a private school, conducted by a scholarly German, with the assistance of his wife and two daughters. In fact, until I attended college at a state university, my only schools were private schools. My parents, to their credit, made this possible, despite their limited resources. I grew up in the belief that public schools were only for those who could not afford to attend better ones. Only later in life did I come to realize that most of our substantial citizens are trained in public schools.

Attendance at a private school threw me into contact, as my father had wished, with "gentlemen's sons"; also with their daughters, for the school was coeducational. I became acquainted with children of some of the "better families," though not, it is true, with any of the very wealthy ones. These boys and girls had very different breeding and very different home surroundings from most of the public school children with whom I had been thrown during the preceding summer. And they were themselves fully conscious of the difference. I began to hear people classified according to their social status. I became interested myself in correctness of dress and speech and points of view, but only in so far as these served as class differentia. I came to recognize that invisible but potent authority which prescribes what is "proper" and what is "improper" to do and say and think—an authority which often seems to be higher than that which prescribes what is right and wrong. The elite, for example, went to church, observed the Sabbath, and held conventional views on religion. I can recall very plainly my feeling of disgust upon hearing my father's blunt reply to my sister when she asked him where Heaven was. "There's no such place!" Not that I was really religious or had any convictions respecting a future life. But the social code called for a greater respect for conventional views on these subjects. One who fails to con-

form to this code lines himself up with the vulgar, who eat their dinners at midday and send their children to the public schools.

In fact, for a short space of time, I became a veritable little snob. This is a highly interesting experience to have gone through, for it enables me to appreciate what snobbishness feels like from the inside. But alas, my period of class-consciousness was not to last long. Snobbishness is an expensive luxury. One must either have money himself or parasitize upon someone who has. My parents, at that time, had a yearly income of a trifle over two thousand dollars. Socially, our family belonged to a distinctly nondescript class. By education and breeding, they belonged to the professional class; economically, they belonged with the skilled laborers and small tradesmen. And in various ways, they were not in a position to "keep up their end" socially. Our house was small, and most of the time we had no servant. My parents would not and could not dress in style, nor would they conform to social usages in many other respects. I remember my father's carrying unwrapped, through the streets of the town, a rabbit which my brother had shot, and selling it at a market for twenty-five cents. This was naturally jarring to a son with social aspirations! I could never reconcile such an action, which was not altogether exceptional, with my father's fastidiousness of speech and his insistence upon various other distinctive marks of a "gentleman."

One important social accomplishment, in which, as it happens, my father strongly believed, was never acquired by me, though I made a serious effort to do so. We boys were sent to a dancing class, which had been organized by a visiting instructor at the leading hotel. I made a very sorry performance of it. Aside from bashfulness, my reactions to orders or signals of any sort were very slow. I suffered from a strange inability to distinguish my right foot from my left. To make this distinction re-

quired thought, and thought required time. I was consequently apt to be a step or two behind my dancing partner, who was commonly not afflicted with such slow-moving mental machinery.

I remember meeting one of these unfortunate ex-partners upon the street, a day or two after the lesson, and being sneered at by her for my awkwardness. I presumed to adopt a *tu quoque* attitude in reply, and suggested that the awkwardness was not all on my side. The girl, the daughter of a prominent Jewish merchant of New York, was not over twelve years old. But it still lowers my body temperature by several degrees to think of the haughty glance and imperious tones with which this child brought our conversation to an abrupt close. She might have been an empress, rebuking the meanest of her slaves.

This slowness of my reactions, in cases where quick decision is called for, has been a handicap in various ways. The difficulty in distinguishing right from left is, I think, rather unusual. At the age of ten, the distinction between my two feet was impressed upon me in the course of "setting-up" exercises at my first school. During these exercises, we stood facing north. For many years afterwards, in order to distinguish right from left, I had to imagine myself facing north, unless I chanced to be doing so in reality. (Rather recently, I met a lady who informed me that she had had exactly this same experience during her childhood.) The same difficulties which gave me trouble in the dancing class caused me later to make a sorry showing at military drill in college. I continually found myself marching in the wrong direction, to the exasperation of my officers and the amusement of my fellow privates.

This awkwardness and seeming stupidity in my neuromotor responses were in decided contrast to my proficiency as a student. I think that it surprised me at

first as much as it did anyone else that I should take an easy lead in my school studies over many of those who ridiculed my ineptitude at dancing and at games of all sorts. I doubt not that the desire to compensate for my incapacity in other fields was in itself a potent stimulus to greater achievement in intellectual pursuits. But I am equally confident that this was not the main reason for my efforts.

One of my chief pastimes during this phase of my existence was hiking, alone or with companions. These trips took me to the Garden of the Gods, to Manitou, and into the various canyons in the nearby section of the Rocky Mountains. Most of my collecting during this period had to do with minerals, with which the local mountains were well stocked. Crystals, metalliferous ores, semiprecious stones and Indian arrowheads were the chief things which found their way into my specimen cabinet. I dug baculites from the shale banks bordering Monument Creek—long, straight objects, elliptical in section, looking like old-fashioned whetstones, covered with a layer of mother-of-pearl. Finding these was an original discovery, for me at least. From a local geologist, I learned the nature of my prizes. They were the shells of extinct mollusks, related to the modern nautilus.

Another truly exciting discovery of a zoological nature was the finding of the cochineal insect upon the local "prickly pear" cactus. I showed some specimens of these to our druggist. He took down a jar of the dried insects from one of his shelves, and promised me fifty cents a pound for all the cochineal that I would bring him—*dried*. My fortune was made! Or at least that was my first reaction. Then I began to figure how long it would take to gather enough of these insects—rather scarce locally—to make a pound of dried material. Another bubble pricked!

It was during this period, too, that I first became interested in chemistry, or at least in messing with chemicals. I was given as a present a made-up set of reagents, which came with a few utensils and instructions for performing some simple experiments. I was at the time inordinately fond of giving "lectures" or exhibitions of one sort or another, and inviting some of my school friends and playmates. This seems curious for one who was so bashful in the presence of strangers. I remember one memorable lecture on chemistry. It is narrated by one of my eastern cousins, who happened to be present at the performance, that I said at one point: "We plathe here a minute particle of a thertain thubthance." According to my own recollection, this is substantially correct, save for the extreme lisp, which I never have admitted and never shall.

Thus far in my life I think that I had never given serious thought to the matter of what business or profession I should follow when I grew up. I recall answering the question of someone on this subject with the reply that I was going to be a "naturalist and chemist." How these pastimes of my childhood could be made to furnish me a livelihood in later years was at this time remote from my thoughts. But I assumed that I should be able to continue them throughout life, and I think that my father sustained me in this belief.

A fancy which I developed at this time for garden plants led me to haunt a nursery in the town, which was managed by a man named Tom. Tom took advantage of my interest in his greenhouse products by giving me jobs washing flowerpots. How much time I devoted daily to that task I do not remember, but I do recall the compensation, which was one ten-cent potted plant every *other day*. Tom offered to give me a course of lessons in horticulture, which were, I believe, to be paid for in labor. By way of illustrating his own proficiency in that art, he

held up one of his plants and pretended to give me its name. This, he informed me, was "*Mesembryanth'um corymbosus floribunda rosea*." And then he proceeded to tell me what each of these terms meant in ordinary English. Curious that I should still recall this fictitious combination of Latin names, including the mispronunciation, after the lapse of nearly sixty years. (See, however, earlier remarks on primary and secondary memory!) Fortunately my father intervened and rescued me from this proposed course in horticulture.

Sex life dawned upon me at the age of about twelve. It was a quite novel experience to find myself suddenly smitten by the charms of a pretty little girl, a year or two younger than I, with brown hair and fascinatingly long eyelashes. I am certain that my feelings throughout were entirely of a romantic nature, with no conscious trace of sexual desire.

Sexual desire of the physical sort was not, however, unknown to me at this age; but the two manifestations of dawning sexuality were kept rigidly apart. The advent of puberty found me, as was probably the case with most boys at that time, almost wholly unprepared. I had, it is true, been primed by some of my companions with the usual line of "smutty stories," many of which had sex for their theme. And I was led to believe that a boy could, if he played the game correctly, enjoy sex relations with girls. Rumors indeed were afloat about the doings of this or that boy and girl whom we knew. These rumors were probably largely baseless, and I believe that in general these youthful *liasons* were far less common than was pretended. But of one thing I am certain. There was scarcely a boy among the group with whom I associated at the time (and these boys were probably quite typical ones) who would not have made overtures to some girl if he had dared. Fear of detection and its consequences proved more powerful than the sexual instinct.

I need hardly say that these remarks apply with equal force to myself.

But the boys also knew another method of relieving this craving. They seldom admitted resorting to it themselves, though they did not hesitate to charge others with the practice. Here again, fear was the chief deterrent to indulgence. All the well-known stories were then afloat regarding the dire consequences of masturbation: insanity, loss of memory, extreme physical weakness, etc., but most particularly the acquirement of a special cast of countenance which was said to betray the victim of the habit, and expose him to general contempt. It is now known, of course, that the fears engendered by these bog-ies are the causes of neuroses which wreak far more damage than the practice which they are aimed to discourage.

It is significant that any method of sexual gratification, whether normal or abnormal, was assumed by us to be very wrong morally. The idea that such pleasure could be anything but sinful I do not think entered our heads. We realized, of course, the relation between sexual intercourse and reproduction, but reproduction was the only legitimate motive for the act. There are, of course, very many adults who still cling to this unfortunate view of sex. But the number of these seems to be rapidly on the wane.

## CHAPTER IV

### ANOTHER STEP EASTWARD

The Colorado Springs episode lasted but three years. Lack of any real opportunity for the higher education of his children became evident to my father, and he must have realized the slender prospects which that little community then offered to a young man in search of a career. Just why Minneapolis was selected as our next place of residence I am not certain, save for the fact that it was the seat of a state university of good standing. I presume that the family doctor was also consulted.

Here we spent the years from 1887 to 1894, and here I attended high school and college. Soon after our arrival in Minneapolis, my parents once more built a house. Our new home was located in a sparsely settled part of town, abounding in vacant lots where the boys of the neighborhood played baseball and other games, and it was near enough to the open country to make this easily accessible to those of us who were disposed to hike. This last fact played an important part in my life during that period. Another important circumstance in my early development was the possession of a workshop in the cellar, which my father had partitioned off for me when the house was built. However, as a residence our place had serious drawbacks. The immediate social environment left much to be desired; the house and lot were both very small; and the house was placed unpleasantly close to our next neighbor's stable.

In relation to my own life, our seven years' sojourn in Minneapolis falls into two periods: three years when I attended high school, or rather a private academy of high-school rank, and four years of college.

The academy had a good reputation in the city, and offered the decided advantage of preparing a student for college in three years, instead of the four which were required by the public high school. However, my brother and I narrowly missed attending the latter, by reason of my father's customary trustful acceptance of whatever he was told. After arranging for our attending the academy, he happened to speak of the matter to the son of one of our neighbors, who gave him to understand that the academy was a very inferior institution. As a consequence of this revelation, my father was about to change his plans for our education, and send us to the public high school, when he chanced to learn that his informant had been expelled from the academy for misconduct.

The tuition charges at this school were surprisingly low, and the student body was not large. I have no idea where the money to pay the faculty came from. The teachers, with one or two exceptions, were conscientious men and women, reasonably well trained for their tasks, and I have always felt that the school was a good one. There was, however, a curious air of formality in the classrooms. Although the students were mainly boys and girls of high-school age, they were all addressed by the instructors as "Mister" or "Miss." I was myself only thirteen years old when I entered the academy, but I cannot recall one of my instructors addressing me by my given name during this entire three-year period.

For various reasons I had very little social contact with this group of boys and girls during my course at the academy. Save for attendance at the weekly meetings of the "Phi Alpha" literary society, and the rare visits of one or two of the boys to my own home, I seldom saw any of these students outside of the school grounds. My real companions were the boys of our neighbors, who belonged to the public school set. These boys—at least those of my own age—were all some years behind me in

school rank; they had, as a rule, no intellectual interests, and they came chiefly from families of little culture. Meanwhile, as a student, I was making an exceptionally good record, and was beginning to show serious interest in scientific subjects.

One incident belonging to this period illustrates the somewhat dual existence which I was then leading. This was the severe reproach, administered by one of my teachers, a woman for whom I had much respect. I chanced, one afternoon, to be kneeling on the sidewalk, playing marbles or jackstones, or some other ultrajuvenile game, with one of the boys of our neighborhood. He happened to be a younger boy than I, and a quite insignificant and unprepossessing one at that. Who should pass by at this moment but Miss L. . . . ! The next morning in class, she took occasion to remark, impersonally but with great emphasis, that when she saw a boy of good mind and good family habitually associating with companions in every way his inferiors, she knew there must be something radically wrong with that boy. I resented the remark keenly at the time, but it stuck in my mind, and I came to think that there must be some truth in it.

However, my choice of companions during that period was not by any means due to mere perversity. These boys were not only my near neighbors, but they were interested in the sort of sports which gave me the greatest pleasure at the time. We roamed through the woods and among the lakes together with our shotguns; we went swimming and fishing and camping in summer, and skating and sledding in winter. One might reasonably regard these things as a pretty solid basis for companionship.

On the other hand, I found myself unable to take part in the social affairs of the boys and girls at the academy. I was inordinately bashful and self-conscious, unversed in the social usages prevailing among young people, and without doubt distinctly "queer," according to ac-

cepted standards of deportment. Had any one at that time taken the trouble to coax or force me into these social contacts, he might have done me a lifelong service, though such an imaginary benefactor would surely have had a tough job on his hands! In general, such disinterested service is not to be expected. Friendship is a reciprocal affair. We rightly expect to receive as much as we give. At that time, I had very little to give, and my balance of trade did not improve much as time went on. It was not until many years later, in New York and Boston, that this disinterested task was undertaken, but by that time the twig was bent too far to allow of full recovery.

As one evidence of my lack of social adaptation, I was given to being jocose when seriousness was called for, and again ponderously serious when everyone else was talking in a lighter vein. Now and then, my ill-timed attempts at facetiousness got me into trouble. I well recall one occasion on a skating pond, when I threw out an inane but harmless pleasantry at a passing skater whom I mistook for one of the university students. The fellow, as it happened, was much older than I, and one of the kind who jealously guard their dignity. He whirled around upon me, knocked me down and cuffed me thoroughly, leaving me with the admonition: "Don't never give no lip to a stranger, kid!" Some advice of the sort was perhaps needed by me at that time, but somehow I have never cherished any feelings of gratitude toward this bully who took upon himself the task of educating me.

As a boy, I was not much of a reader, less of one, I believe, than some of the neighbor's boys, who were anything but scholarly in their tastes. For they, at least, read some of the more thrilling fiction of the day. I may note here that I have never throughout my life been an extensive reader. For a man who has followed one of the "scholarly professions," my acquaintance with what is commonly known as "literature" is woefully deficient.

The well-known author of a recent autobiographical narrative makes the amazing statement that during one two-year period of his life he read nearly 900 volumes! I am certain that I have not read nine hundred volumes (i. e., bona fide books) in my entire lifetime. This limitation has been due, in part at least, to the rather prompt onset of ocular and neural fatigue.

I did read Tom Sawyer and Huckleberry Finn, but this was one of my early sins. It was during that amazing period when these books were being denounced by high-minded people as unfit reading for boys. At least one library in a staid old Massachusetts community had immortalized itself by excluding these masterpieces of Mark Twain from its shelves! And so my father forbade me to read them. But a neighbor's boy corrupted me. He secretly lent me the two immoral volumes. It was not for several years that I confessed my transgression to my father and received his reproaches.

During summer vacations, and on holidays during the school sessions, I spent much time with my shotgun, alone or with one or more of these companions. The entire country in the vicinity of Minneapolis was dotted with lakes and ponds and sloughs. I think it likely that some of these bodies of water have long since dried up or been drained. Even in that day, the recession of some of them was noticeable within the course of a few years. The head of the geology department of our State University used to deliver a stock lecture on "The Formation and Deformation of Minnesota Lakes." Various factors were at work, converting lakes into swamps, and swamps into dry land—the deposit of silt, the growth and decay of aquatic vegetation and the cultivation of the surrounding soil. Many lakes, he said, had already been converted into meadowland, and thousands more would disappear within the coming century.

Those lakes and swamps in the Minnesota woods gave me as a boy the thrill of real exploration. Most of them contained fish and frogs and turtles, and they served numerous water-birds as nesting and feeding grounds. If there were any game laws in those days, we boys knew little of them and cared less. Nothing that came within range of our shotguns was "protected" except by our own poor marksmanship. There was no "closed season" on anything. Not that we ever brought back any game worth mentioning. I do not believe that I have bagged a half dozen ducks in my life, and one unsuccessful shot at a deer exhausts my experience with "big game." But I think that I know the thrill of the chase which stirs real hunters in their pursuit of real game. There were grebes which we called "hell divers," and bitterns which we called "shite-pokes," and terns which we called "sea gulls" and chattering kingfishers, and various little waders which passed as "snipe." Stalking a great blue heron was as exciting adventure to us boys as stalking a lion would have been to the immortal Teddy. Fortunately, we scarcely ever had a chance to kill one. The land birds of all sorts were no less ruthlessly hunted, and the more beautiful the bird, the greater prize it seemed. How glorious it was to bring down a scarlet tanager, an indigo bunting or even a kingfisher! To have bagged a bird-of-paradise would have been even more glorious, but fortunately the diameter of the globe intervened to prevent this.

My interest in those living targets was scarcely at all scientific at that time. It was merely part of my contact with the great out-of-doors. I picked up, to be sure, the common names of the more familiar birds, and I learned the kinds of nests they built and the eggs they laid. I even tried my hand at taxidermy, with a reasonable degree of success for a youngster of fourteen or fifteen. But it never occurred to any of us boys to consult

a book on ornithology, or to make careful observations of any sort.

There was a taxidermist living in a rather out-of-the-way part of the city, whom some of us boys visited on occasions. We thought ourselves well repaid for a long walk by glimpses of his handiwork. The man's name, as proclaimed by his sign, was "Arg Buck." I never knew whether Arg was really his first name or was merely an abbreviation. Buck's prices for his handiwork were certainly not extortionate. Ordinary small specimens were mounted for from fifty cents to a dollar each, though this, in view of the quality of his workmanship was probably as much as they were worth. However, taxidermy was not Mr. Buck's only source of revenue. When the business of bird-stuffing was slack, he could be seen driving a dirt team. Taxidermy, as represented by the best work of our modern museums, has certainly moved a long way since the time that almost any teamster thought himself competent to "stuff" birds and mammals!

If any of my interests in these pre-college days could be called scientific at all, they were directed toward electricity rather than toward animals. Edison was then my idol, whom I expected one day to rival or surpass. I tinkered with homemade batteries and induction coils, and constructed simple apparatus for generating static electricity. More practical than any of these was an alarm clock which I arranged in such a fashion as to close a circuit at the moment of "going off," thus lighting a small electric lamp and ringing a bell which I had screwed to the head of my bed. The latter continued to ring until I got up and turned a switch. In those days, I carried a delivery route for one of our local papers, in the early morning before school. Also I slept so soundly that on one occasion two alarm clocks in succession had failed to wake me. Hence this rather drastic measure which I adopted to insure my rising on time.

I had been given two volumes dealing with electricity, and at about the same time a subscription to the *Scientific American*. But I never progressed very far with the fabrication of scientific apparatus. With the books and tools at my disposal, I ought not to have been content with such imperfect results as I achieved. One of these books contained detailed and I think quite practicable specifications for the construction of both a motor and a telephone. I followed these to a certain point, but I lacked the patience to carry them to a successful issue. Unfortunately, I was not spurred by any spirit of emulation. None of my companions was seriously engaged in such pursuits, and competition was therefore entirely lacking. Rivalry and competition are necessary stimuli to one's best efforts throughout one's life, and in every sphere of activity. Science and art are no exceptions.

However, there was one salutary result from my mechanical activities at this time. The use of tools which I then acquired has been invaluable to me throughout life, both at home and in my professional work. An experimental biologist must be not only an inventor but a carpenter and various kinds of a mechanic. In a small way, I have had to be all of these things. Thus my hours in that Minneapolis cellar were not by any means wasted.

By the time that I was ready for college, my companionship with the boys of our neighborhood largely came to an end. For one thing, our common interests had waned. My anemic preoccupation with scientific topics was naturally viewed askance by a group of youths to whom sporting events had come to occupy the leading place in the world's affairs. I had never even attempted to acquire the lingo of the race track, the prize ring or the baseball diamond. But here all about me was a world of chesty connoisseurs who cultivated the "physiognomy of astuteness" and looked disdainfully upon the poor defective who could make no pretensions to such erudition.

But there was another equally important reason for this waning of our comradeship. Adolescence was in full sway, and with it the call of sex. My companions yielded to the call. First it was some of the "tough" girls of their acquaintance, later the professionals of "First Street." That I did not participate in these adventures was not in the least a matter of "morals." It was not even fear of venereal disease, for little had been said about "social hygiene" in those days. The real reasons for my remaining "pure" at that time were bashfulness, fear of discovery by my parents and lack of pocket money. My companions were not thus restrained. That was the only difference. And so their urge was gratified, while mine was denied a normal physiological outlet. I had my imaginary harems, to be sure, situated upon dream islands in tropical seas, and these were peopled by girls of wondrous sex appeal—some of those very same girls, indeed, whom I scarcely dared speak to in real life. Such day-dreaming brings little satisfaction and is hardly conducive to healthy mental growth.

From the viewpoint of a life not far from completed, I am compelled to agree with those who contend that our present social and ethical standards relating to sex are profoundly inadequate. Various writers have deplored the length of the interval which must elapse between the age when nature intended that a human being should mate and the age when society permits him (or her) to do so. It is a period when a considerable fraction of one's total energy is expended in resisting perfectly natural cravings, which are at times overpowering. The alternatives to this continual repression are sex relations which are biologically normal, but too often disastrous in other ways, and autoerotic practices which are physiologically and psychologically abnormal.

Those who defend the officially accepted standards of the day appear to be as blind to the actual facts of the

situation as were the defenders of the late unlamented system of national prohibition in another field. Questionnaires which have been circulated to determine the proportion of persons who *admit* having had pre-marital sex relations yield figures ranging from fifty per cent up for men, and from five or ten to forty-seven per cent for women. These are returns from supposedly "superior" groups. We of the older generation are doubtless excluded from the more immediate sources of information, but there are strong reasons for believing that a revolution in sex mores may now be under way.

It will be a difficult task to arrive at a workable middle course, which will avoid the bodily and mental evils of complete repression, on the one hand, and on the other the yet more serious demoralization which would follow a regime of unrestrained promiscuity. It is not my intention to suggest where the sought-for golden mean will lie. It is possible that Judge Lindsay's proposal to sanction early "companionate" marriage, of no necessary permanence, would be a step in the right direction. Any satisfactory system must be evolved by human society through the slow process of trial and error. There is, without doubt, serious danger at present in the possibility of a sudden abandonment of previous restraints, following dissemination of the knowledge of contraception, and the rejection of a supernatural basis for morals. But admission of this fact is no argument for enforced ignorance of birth control methods, nor for a return to outworn religious dogmas.

Of one thing I am sure, however. No scheme of relations between the sexes will succeed which is not based upon absolute honesty. If it should turn out "companionate," or even pre-marital, intercourse is desirable, or at least inevitable, let this be incorporated into our accepted social and ethical standards, and not practiced stealthily, under conditions of hypocrisy and deceit, with ostracism as the penalty for detection!

## CHAPTER V

### I ACQUIRE A HIGHER EDUCATION—OF A SORT

My college career I look back upon with very mixed feelings. From the standpoint of formal education, it was highly successful. Socially, it was an almost complete failure. In academic standing, I stood fourth in a class of seventy-four; I was elected to Phi Beta Kappa, and on graduation was awarded a fellowship, I believe the single one which the university then boasted. But I took little part in "extracurricular activities," and none at all in social affairs; I scarcely ever entered the homes of my classmates, and graduated with very few intimate friends among students or faculty. With none of my classmates, indeed, have I kept in close touch in later life. That I was not a fraternity man goes without saying.

There was not, I believe, much positive dislike of me on the part of my classmates, though this feeling was not altogether lacking. On the other hand, there could have been very little real admiration. Except as a student, I am sure that few took me very seriously. I think that I was regarded by instructors and classmates alike as a diligent and keen-minded student, with some degree of originality, but also as a young man who was morbidly self-conscious and emotionally unstable.

I entered college in the month following my sixteenth birthday, and thus graduated before I was twenty. So far as I know, not one of my classmates was younger than I, and at least one was twelve years older. I was the baby of the class, and a rather obstreperous baby I was! In the classroom I was self-assertive to a degree, prone to ask questions and to offer suggestions for the benefit of my elders. For this I was now and then repressed by my instructors, but not nearly so often, I believe, as the

situation called for. For a while, I participated in our class meetings, where I was given to voicing minority viewpoints, protesting particularly against the dominance of intercollegiate athletics in college life. Needless to say, I had no following in such Utopian efforts to elevate our scholastic ideals. Indeed my tactics were not calculated to attract possible sympathizers.

However, it would not be fair to say that I was altogether repudiated by my fellow-students. I served my term as president of one of the two college literary societies, and was also elected president of our "Fortnightly Scientific Society," an organization which I helped to found. Certain other honors have already been mentioned. I have at least the satisfaction of knowing that these honors, such as they were, were a tribute to my reputed ability, and not as so often happens, because I happened to be a "good fellow."

For a while, my chief associate was a quite remarkable young man whom I shall call "Mark Darrow." Darrow had some of the attributes of genius. With good physical health and greater stability of character, he would probably have distinguished himself in science or philosophy, possibly even in poetry. He was an omnivorous reader and keen thinker, quite untrammelled in his viewpoints by the opinions of others, whether those of his professors or his fellow-students. Had he possessed the physical stamina, I think it possible that he could have led the class in any branch that he chose. As a matter of fact, he soon began to neglect his formal studies, and he left college before reaching his senior year.

Darrow was of about my own age, and quite youthful in speech, manners and appearance. With those whom he liked, he was capable of being quite companionable, and when in the mood, he seemed to have the normal buoyancy of youth. But more typically, he was an utter pessimist. He had no plans for life, for life was not

worth living. His favorite philosopher was Schopenhauer, whose works he read in German. He was irresponsible in most of the relations of life, bought whatever he wanted, with little regard for family finances, accumulated a considerable stock of books by the simple device of having them charged to his account, and began personal experiments with the use of alcohol and opium. His health was the last thing he thought of.

Just what form of neurosis Darrow suffered from I do not know. His trouble, I have reason to believe, was partly hereditary. He disappeared from home for two considerable periods, finally contracted tuberculosis of the larynx, and died a few years after I left college. It is such cases as Darrow's which give credibility to the belief in a close association between genius and mental instability.

Darrow and I were both militant agnostics. As freshmen, we started out to found a society for the exploitation of our views. So we drew up a notice, calling upon "all persons interested in the study of religion from a scientific standpoint" to assemble at a stated time and place. This notice we took to good old pious "Prexy" Northrop, and asked him to read it at the chapel exercises that day. Prexy first obtained our assurance that nothing was contemplated which would be in any way prejudicial to religion, and then promised to read the notice. We heard it duly read. Then we betook ourselves to the place of meeting and excitedly awaited developments. The attendance much gratified us—at first. Everyone wanted to know who was responsible for the notice. Two freshmen! And very fresh freshmen at that! You know, of course, what happened. Nothing else could have happened. After a rather ridiculous endeavor by us two youngsters to control the situation, the whole matter was taken out of our hands by the older men.

However, a new college organization, "The Investigators," was launched in consequence. Officers were elect-

ed and a committee appointed to draw up a constitution. This last was a gem. I well remember the article stating our object. One could hardly forget it. "The object of this society shall be an honest, impartial investigation of all those vital problems which concern our relation to humanity and the universe". It required, I believe, about two years for us to solve all these vital problems. At any rate, the society lasted about that length of time.

The "Investigators" brought together a rather non-descript collection of students. At the right end of the line were two or three of the most solid men in the university. One of these became a distinguished chemist at Harvard; two others became professors of physics in leading universities. At the left end was a swarthy little Russian Jew—a cripple, and self-styled "philosophical anarchist"—and another singular looking man with an immensely high forehead and rasping metallic voice who always reminded me of the portrait of some medieval schoolman. Somewhere between these two extremes were our two vociferous young iconoclasts, whose youthful bumptiousness had to be kept under control by their elders. The few girls who first heeded the summons soon dropped out of our ranks. "Radicalism" was not very popular in those days among the ladies.

An interesting mimeographed volume of the autobiographies of surviving members of our class was prepared by our class secretary on the occasion of the fiftieth anniversary of our graduation, in June, 1944. Very few of us have achieved even a moderate degree of celebrity on a nation-wide scale, which after all is not surprising. The most widely known to the public amongst us was probably A. P. Anderson, the inventor of the "puffed" cereals. He was a modest youth of Scandinavian parentage, prone to making practical inventions, even in his college days. I hope that he was rewarded with a fair share of the profits which must have been derived from those deservedly popular cereals.

Shortly before his death, "A.P." surprised his classmates by the publication of a "Seventh Reader," a rather massive volume of stories and sketches, based upon his early life as the son of a pioneer Swedish farmer in Minnesota. This volume reveals a poetic vein in its author, which some of us never suspected.

Another classmate who made money was also a man of Scandinavian stock, named Hovland. He was a cheerful but unobtrusive fellow from the farm; honest, hard-headed and hard-working. Like many of our students, he earned part or all of his expenses through college by outside work. Hovland stayed on for a year of graduate study after completing his college course. It was my intention to do the same, and he and I took a room together. An amusing episode during this association between us arose from a damage suit which I brought against a livery stable keeper as the result of being run into by a "hit-and-run" cab driver, while I was riding a bicycle in the evening. Since I was nearly a year short of legal majority, the court had to appoint a guardian for me. I nominated Hovland for this position, and we had great mirth over the relationship.

Not long after this episode, I left Minneapolis and the university permanently, as will be narrated shortly. My parents had gone some months earlier. After that, I did not see or hear from Hovland for about ten years. I was then living in New York, a teacher and a married man. One day, to my surprise, I received a letter from him on the stationery of the Waldorf-Astoria Hotel. What could he be doing there? In response to his invitation, I dropped in to see him. He was in New York on business and those were his quarters. I learned for the first time of his career since leaving college. It was a success story according to the Horatio Alger model. After working for a year on the meagre pay of an assistant at the

university, he went to the iron mines of northern Minnesota and found a more lucrative job as a day laborer. Fortunately, he knew something of physics and chemistry. He climbed the ladder, step by step, became in time one of the owners of that mine, and soon of a lot of other mines, in Minnesota and elsewhere. A few years after our meeting in New York, he was appointed a regent of his Alma Mater.

Hovland enjoyed a practical joke. He dined one evening with my wife and myself in our New York apartment. On leaving, he inadvertently (or so he pretended) exchanged overcoats with me, taking away my inexpensive and rather dilapidated garment, and leaving his own coat of broadcloth. I was worsted in the tussle which followed, and I could not find him in his hotel on the following day. I have not seen Hovland since. I believe that he is no longer living.

One picturesque figure in the class of '94 was a huge fellow of powerful physique named Harding, a man of simple, likable disposition, who held the unusual record of being a football star and one of the best students in his class. As a biological fact of some interest, it may be mentioned that this young giant was born when his father was well over seventy years old. He became a member of the faculty of the university, and held this position until his death some years ago.

From the foregoing account of myself, it might be inferred that girls played little or no part in my college life, and this, in a sense, was true. I can recall but two occasions in those four years when I so much as escorted one of the women students to an evening meeting. Nor was there one with whom I felt intimate enough to call her by her given name. It was in every case "Miss" and "Mister" between us.

But I was no misogynist, however much I may have pretended to be at times, and these distant relations were

not the result of my own choice. They were due in part to my painful shyness and to the social handicaps to which I have already referred. There were several of the more intellectual girls of the class with whom I used to converse outside of the classrooms. We discussed, as I remember, only the most serious matters, such as problems of science or philosophy or religion. A few of these girls displayed a certain sort of interest in me at first, but rather, I suspect, because they looked upon me as an unusual psychological specimen. Be that as it may, I was highly impressionable, and experienced at this time a few rather violent heart-pangs. These pangs were unexpressed, of course, and were probably unsuspected by those who were responsible for them, but they served at times to make me profoundly miserable.

Increasingly I came to feel at this time the grotesque absurdity of the current religious optimism, which pretended that each individual amongst us was the object of solicitous care on the part of a loving and all-wise "Heavenly Father." Admitting the possibility of some inscrutable plan whereby pain and misfortune were inflicted for the highest good of those concerned, it was not afflictions from without, even the most tragic ones, that really gave the lie to this optimistic pietism. It was those afflictions which sprang from the inherent defects of the person himself — contradictions of temperament and mental maladjustments which rendered impossible his normal development in any external environment whatever. If there were any "divine plan" at all, that plan had nothing to do with the welfare or happiness of the individual man or woman.

It was thus that I reasoned as an undergraduate student, and I must admit that nothing which I have learned or experienced in later life has revealed any serious fallacy in this logic. However, the earlier feelings of personal bitterness have largely subsided.

A few years after my graduation I composed a "poem"—for I too underwent a brief attack of juvenile versification — wherein I voiced my rebellious mood toward the Cosmos. The poem was entitled "His Last Defiance"—the defiance hurled by a condemned criminal at a well-meaning visitor to his cell, bent on saving his soul. I think that one of the four stanzas of this masterpiece will be quite sufficient for present purposes.

You prate of sorrow's use—the "chastening rod"!  
You may who ne'er have suffered more than pain.  
One bowed with grief, bereft of all he loved,  
Or stricken sightless in a sunny world  
Might gather strength beneath the load he bore;  
But force there needs must be to cope with force.  
How now the creature whom the world calls bad?—  
The slanting brow, the visage warped that tell  
Of soul yet worse deformed—what use have these?

So far as I know, there was only one of my girl classmates who was destined to attain any degree of celebrity. This girl had, in her college days, considerable personal fascination, a somewhat theatrical bearing, and an unconcealed ambition for literary fame. She was one of those who, for a brief spell, endeavored to draw me out. Quite cosmical in her outlook, her interests seemed to range through the whole field of philosophy, science, religion, music, art and literature. At first I was dazzled. Then I came to regard her as a poser, without depth or substantial ability. I was so irritated by some of her ambitious literary contributions to our college weekly that I wrote a satirical article, holding them up to ridicule. But I did her injustice. Years later, she produced a "powerful repellent drama," as it was termed in a leading review, aimed at portraying the wickedness and futility of war. The leading role was played by Mme. Nazimova, and the production met with rather wide acclaim.

I will stray beyond the confines of my own class, and refer to two other contemporaries of mine, members of the class of '95. I used to debate socialism with them in the main hallway, between classes. But no, debate is hardly the word that I want. These men knew something, at least, concerning the subject matter of our discussions. All that I was able to contribute was the usual stock of popular catchwords and prejudices, along with some dogmatic assertions in favor of capitalism which I had picked up from my father. Shortly after leaving college, one of these young men, Algernon Lee, became the editor of a local socialist paper. Later, he was more than once the Socialist candidate for mayor of New York City. His fellow "red" was later the author of some widely used secondary-school textbooks on biology. I do not know how long he remained actively interested in the overthrow of capitalism.

I have long since been forced to a viewpoint which might well be covered by the rather vague term "socialism." My own disgust with "rugged individualism" long antedates the days of the "New Deal," when it has become anathema to a large proportion of our population. However, I am not sure that my early contacts with socialism had much part in this change of view. On the contrary, I was repelled by the language of abuse and class hatred with which its propaganda was conducted. My conversion to a socialistic outlook was due rather to my own growing realization of the many obvious elements of injustice in the present social set-up. One of the examples of this which impressed me earliest was the inheritance of wealth, with its inevitable corollary, the inheritance of poverty. Another was the privilege which an individual now enjoys, in this world of very finite dimensions, of acquiring, holding, and deeding "to his heirs and assigns forever" vast tracts of land, forest or mineral wealth—the "owner," in many cases, acquiring his prop-

erty through no serious effort of his own, and doing nothing more useful subsequently than to lease it and draw rents or royalties from it. Indeed, he may, with full sanction of the law, destroy an age-old forest, or permanently ruin countless acres of soil through his ignorance or wanton disregard of the operations of erosion. The flagrant injustice—the grotesque absurdity—of such privileges as these have impressed me without the need of any socialistic arguments. That any intelligent person can view the matter differently is hardly comprehensible to me. And yet in many parts of our country, the open avowal of such opinions would disqualify a man for public office or for the career of teacher, editor or preacher.

That these intellectual convictions are in many of us reinforced by powerful emotional reactions may be readily admitted. What man of spirit can fail to resent the arrogance and calm air of superiority which is so often displayed by those who have chanced to benefit on a large scale from these wholly unmerited privileges? Likewise, what man of spirit can fail to rebel at the militant forces of intolerance, repression and espionage which are now working so busily in the interests of the *status quo*? Their obvious aim is to standardize the teaching and preaching of this country on a strictly moronic level. But this discussion has carried me far beyond my college days.

I am tempted to undertake sketches of some of my college instructors. Of a few I am able to speak in warm praise. A few others would merit the best efforts of a clever caricaturist. The great majority, I believe, were mediocre, conscientious and reasonably competent.

My greatest personal obligation was to our professor of zoology, Henry F. Nachtrieb. It was he who was largely responsible for my return to biology as a life career, and it was he, more than all the others, who threw special opportunities in my way, and who gave me the per-

sonal backing which is often so important to the success of a student. To us freshmen, at the commencement of his zoology course, Nachtrieb had an air of sternness, both in feature and in speech, which filled us with a feeling approaching terror. To be called up by him for recitation was a sorely trying experience. For a while, we all cultivated a curious Nachtrieb myth, relative to his own extraordinary profundity of knowledge and to the exacting standards which he required of his students. But these illusions were dispelled before long. Instead of a scientific superman, with slight capacities for sympathy, he took on a very human form. Those of us who showed real interest in his department of knowledge became the objects of his genuine affection. The stern exterior was only a mask. It would be hardly fair to call our later sounding of his mental depths disillusionment. We learned to know in him a man of high scientific ideals who was thoroughly sympathetic with research on the part of his students. Just why his own efforts in these directions were so largely inhibited was one of the perennial topics of discussion among his young friends at the university. Be that as it may, I believe that Nachtrieb's influence was an important element in the success of more than one of the research men who received their first training from him.

It was my good fortune, during two of my summer vacations, to be a member of the collecting parties which were sent into the field by Professor Nachtrieb. On each occasion, there were four of us, Darrow and I and two others, though the personnel of the parties was not entirely identical. Our task was to collect and preserve zoological specimens, particularly fishes. We carried a tent and camp equipment, a birch-bark canoe, seines, tanks of alcohol and fixing reagents. We commenced with some of the small lakes near Minneapolis and extended our operations farther into the wilderness. For,

in those days, there was still a good deal of wilderness left in Minnesota.

Collecting fishes might seem a very prosaic occupation, lacking any trace of romance. Yet volumes have been written on the romance of angling—of casting a single baited hook into a pool or stream and catching, if one is lucky, an occasional fish. In contrast to this, we often experienced the thrill of catching our fishes by the seine-load. To drag a net through unexplored waters and land a wriggling assortment of fishes of many species, some of them altogether new to us, was the occasion of no small excitement. It combined the sport of the angler with the scientific interest of the zoologist. I may say that those experiences permanently quenched my enthusiasm for hook-and-line fishing. Such meagerly rewarded efforts thereafter seemed futile.

Through these expeditions we developed a considerable acquaintance with the fish life of our state. And our acquaintance extended to numerous forms which the angler does not ordinarily see—the countless species of little minnows and darters, and even some of the larger fishes which are not often caught on the hook. I remember my first encounter with the archaic group of ganoids, in the person of *Amia calva*, the “dogfish” as it was called locally. And again my surprise on discovering the existence of a fresh-water relative of the cod, *Lota*. This last was also called “dogfish” by the natives. Popular names are as ambiguous as “scientific” names are ephemeral! *Lota* was so sluggish that we were able to spear large specimens with an oar. I even recall catching a specimen two or three feet long by hand. A “fish story,” doubtless, but a true one.

We carried as our guide Jordan's “Manual of the Vertebrates.” Our identifications were not always correct, but I do not think they were often far from the mark. In any case, they provided us with a set of names

by which to designate our fishes, and what was far more important, with a general idea of their relationships to one another.

Our collecting expeditions had their share of comic episodes of which I shall narrate only one. We were working a few of the small lakes north and east of Minneapolis, seining for the most part, as was our wont. In general, seining was strictly forbidden by law, for the obvious reason that it would speedily have depleted the fish supply of any lake. We were employed by the state university, and consequently carried a permit for the collection of specimens. It chanced that at the time I speak of some epidemic disease was rampant among the fishes of these lakes. Dead fish abounded upon the beaches. A Minneapolis newspaper carried the sensational news that parties were seining in the local lakes, catching fish in enormous numbers, and leaving the greater part to die and rot upon the shores. Speedy action by the authorities was called for.

One afternoon, the two older members of our party were away somewhere with the seines, while Darrow and I held down the camp. It was, I believe, at Lake Johanna. A tall, lanky individual with a constable's badge and a very nasal voice descended upon us and placed us under arrest. He showed a warrant for the arrest of "John Doe and Richard Roe". The charge was catching fish by means of a seine, in violation of state law. We explained that we were working for the state university and held a permit. "The law don't exempt no man," replied the constable, and that was that. It appeared that the fellow had already rounded up our companions with their nets, and taken them to the justice's court at New Brighton. He had then returned for Darrow and myself with the "Doe and Roe" warrant. Darrow and I had never heard of this legal fiction before and were hugely amused. We demanded to know which of us was Doe

and which Roe. We were not enlightened. In the constable's presence, we pitched a coin to decide the point. The officer of the law was irritated. He ordered us to "step on it," or whatever was the vernacular equivalent back in the nineties. And so we accompanied the grim representative of law and order, on foot I believe, to New Brighton. My most vivid recollection is that of our lanky escort's nasal tones as he reiterated, in response to our protests, that profound legal truth: "The law don't exempt no man."

However, our guardian of the law was to receive a rude shock. The following day, Professor Nachtrieb hastened out from Minneapolis, and we had a hearing before the justice. We were promptly released, and the nets returned to us. Nachtrieb had to suppress the exuberant display of ridicule with which Darrow and I started to pay off our score against the constable.

On the last of our expeditions, we camped for some days on Lake Itasca, thence descending the Mississippi as far as Lake Winnibigoshish. This today doubtless sounds quite unexciting, but it was a real adventure in the early nineties. At the outset, we had a two days' journey by horse and wagon from the railway terminal at Park Rapids through the woods to Lake Itasca. Over this wretched road, all of us but the driver had to walk. After breaking camp at Itasca, we proceeded down the river with a canoe and a rowboat. "River," did I say? Well, it was so called on the map. However, it did not contain enough water to float our heavily-loaded rowboat, even when we got out and waded. Finding ourselves hopelessly stranded, we hurried back to the house of the one settler then living on the lake and procured from him a shovel. Thereupon, we deepened by hand the channel of the Mississippi River sufficiently to carry our flotilla. At least for a while. The next obstacles were numerous pine trees which had fallen across the stream and given

rise to natural dams. Fortunately, we had an ax with us or we should be there yet. And so we chopped and shovelled our way down stream, standing at frequent intervals in cold water which came to our knees or even at times to our waists. I remember one occasion when we jumped precipitously out of the boat into rather deep water to escape the wrath of a colony of hornets which had built their nest on an overhanging branch. It is my recollection that we spent three days in covering the first seven miles of this journey.

But the infant "Father of Waters" emerged at last from the forest and entered a more level country, through which it followed a tortuous course, spreading out at times into extensive swamps, where the channel sometimes lost itself in the dense growth of water plants. And then, one after another, came the big lakes, Bemidji, Cass and Winnibigoshish. We had to row and paddle through these lakes, keeping fairly near to one shore for safety's sake. After that came a search for the outlet, which was not always easy to find. We camped at intervals on the way, of course, drawing our seines, setting gill nets, and trolling for fish, towing for plankton, and filling our tanks and jars with plunder.

At one of the lakes, Bemidji I believe, we chanced to cross the trail of another party of two, returning from a geological trip in the country further north. One of the party was my classmate Hovland. We naturally held a reunion. That night there was a powwow at an Indian settlement on the lake. We could see their campfire and hear their shouts and the booming of their drum. Our party of five from the University of Minnesota got into our rowboat and stealthily paddled over to a point near their camp. Then we let loose a sound more terrifying than any Indian war whoop. It was our college yell. Abrupt silence in the camp! Then one brave stepped forth and addressed us, but not in the Chippewa lan-

guage. "Go to Hell!" We took the hint and retreated. Our speed was redoubled somewhat later when a rifle shot was heard.

It was at Bemidji, or somewhere in that region, that we came across a man named Carson, said by the other white settlers to be a son—or a grandson, I forget which—of the famous Kit. True to ancestral tradition, he had taken unto himself a squaw, and was conducting an Indian trading post.

Hardly more than a decade before we visited Lake Itasca, a notoriety seeker named Willard Glazier had announced his discovery of the real source of the Mississippi River. He selected a small tributary lake, already well known and mapped as Elk Lake, renamed it "Lake Glazier," and for some years conducted a persistent and altogether unscrupulous campaign to have this name officially adopted. As late as 1891, he erected on the shores of Elk Lake an imposing sign, recounting the exploits and the personnel of the first and second "Glazier Expeditions." All this in a country which had been explored by Schoolcraft nearly sixty years earlier! This sign was standing at the time of our visit in 1893 and afforded us much irreverent amusement. Even later than this, we learned that Glazier was lecturing to eastern audiences on the "source of the Mississippi." His hearers were probably of the sort who believed that western cities were still subject to Indian raids, and that express trains had to pause and allow herds of buffaloes to cross the tracks.

How much remains of the aboriginal beauty of Lake Itasca I have no idea. Nor should I care very much to return to find out. It is now, I believe, one of the attractions which Minnesota offers to the visiting motorist. I was fortunate enough to see it when it was still surrounded by the forest primeval, without any disfigurements due to human agency. However, I must not lay too much stress on my own early appreciation of the un-

tarnished beauties of nature. I recall that one of our pastimes, when we camped on this lake, was to chop down some of the stately pines which grew upon its banks, merely for the sake of making speed records. I remember betting with one of my companions that I could cut down a certain tree in—let us say—twenty minutes. Before commencing the job, I placed an additional bet that I could do it in fifteen minutes, and finally one that I could do it in ten. Though very far from being a Paul Bunyan, I was able, as it happened, to win all three of the bets. Before the lowest time limit had expired, the big pine crashed to the ground. I was not much of a conservationist in those days!

These adventures among the lakes and streams and woods of Minnesota were a glorious experience—at least in retrospect. They provided me with a stock of memories which have enriched my life in no small degree. And yet at the time there was much misery connected with them, quite enough, perhaps, to outweigh the pleasure. Physical discomfort of every sort, dubious camp “grub,” the personal friction which seems to be inevitable in any small group of isolated mortals, and above all else the mosquitoes, combined to take the joy out of life. In the evening, and frequently in the daytime, swarms of mosquitoes followed us everywhere, keeping us busy fighting them off with both hands. When, as frequently happened, our hands were otherwise occupied, the pests made the best of their opportunities. With the onset of night, the separate shrill hums of individual mosquitoes gave place to a mighty roar of thousands. Elaborate precautions were required every evening to make our tent mosquito-proof, and then followed the hunt for those which had entered during the day. With these disposed of, we were able to sleep, though it sometimes happened that the enemy discovered some weak spot in our fortifications during the night, in which case the lightest sleeper in the party sounded the alarm and the attack was repelled.

Under such conditions, esthetic appreciation was naturally sadly impaired, and enjoyment of any sort reduced to a minimum. Fortunately, one can dissociate in his memory the beautiful scenes and exhilarating occupations from their accompaniment of discomfort, worry and actual pain. If I may generalize, I am tempted to say that most of the pleasures of life, and especially the enjoyment of travel, are of this retrospective type. In the actual experience at the time, the painful elements frequently predominate. But the selective action of our memory shifts the emphasis entirely, and gives us joyful recollections of some experience which we would not live through again at any price—at least if we paused to think.

There was a time, during these early fish-collecting days, when I conceived the notion of undertaking more extensive travels in search of these creatures. Two or three of us zoology students amused ourselves at one time with planning a trip to South America. As spokesman for the group, I wrote to David Starr Jordan. We were surprised and elated to receive a letter from his secretary, stating that Dr. Jordan had set aside the sum of two hundred and fifty dollars (I believe it was) from Stanford University funds for this purpose! It was probably merely a characteristic gesture of encouragement on the part of the great ichthyologist to a group of aspiring students. However, my own first reaction was to hail this modest contribution as an all but sufficient guarantee of the necessary expenses of our expedition. None of us had taken the trouble to calculate the actual costs of such a project, and two hundred and fifty dollars seemed a vast sum of money.

This episode is rather typical of my early attitude toward money matters. During my entire youth, and to a certain extent throughout my life, it has been difficult for me to regard the acquisition and expenditure of money as subjects worthy of the same intensive thought

as is required for the solution of a scientific problem. I was by no means indifferent to the need of money, to be sure, and I resorted to various ways of obtaining it. But with the exception of occasional jobs, yielding a definite wage, my ventures in the field of money-making were uniformly unsuccessful. I made no serious effort either to forecast the necessary expenses or the probable profits of a project, and was left on several occasions with a considerable deficit, for which my father had to assume responsibility.

Years later, E. W. Scripps—who, by the way, regarded all of us scientific research men as “economic imbeciles”—remarked to me: “If you would only devote as careful thought to your financial affairs as you do to your damned mice, you might be in easy circumstances.” But there have been few times in my life when my “damned mice,” or whatever else it happened to be, did not interest me vastly more than the possible accumulation of wealth. To a person engaged in any useful occupation, it seemed to me, a reasonably sufficient income should be a thing to be taken for granted, as much as the air which he breathes or the water which he drinks. One’s attention should not be diverted from the real things of life by having to provide for the satisfaction of these basic needs and basic rights. In our present world, such a viewpoint is of course, glaringly naïve and impractical. Perhaps it does, in truth, represent a mental state having much in common with imbecility. But if so, we have here a measure of the distance which we must travel before we arrive at a true state of civilization.

Next to biology, the field which interested me most in my college days was that of philosophy and psychology—for the two were thrown together in a single department at the time, and indeed were taught by the same man. It was not my privilege to fall under the influence of Dewey or Angell or Woodbridge, all

of whom held positions at about that period in the philosophy department at Minnesota, although in each case either before or after my term as a student there. Had my professor of philosophy possessed even a moderate amount of enthusiasm, or a personality calculated to inspire the inquiring student, it is more than possible that I should have entered this field rather than that of biology. For I was fascinated both by metaphysical problems and by the workings of the human mind. At times, indeed, these matters appeared to me to be vastly more significant and fundamental than the superficial and largely trivial topics which seemed to form the subject matter of the natural sciences. But the professor then in charge was a man of narrow outlook, wholly devoid of humor, and too much concerned with the requirements of Christian orthodoxy to be an impartial judge of truth. He was, to a large degree, a disciple of Hegel. I was, at that time, reading the works of the great Victorian evolutionists. These men, Professor —— believed, had no business meddling with philosophy at all. They were mere scientists, and ought to know enough to keep on their own side of the fence. Our recitation periods sometimes degenerated into arguments between myself and the professor regarding such matters as the significance of evolution or the real basis of moral conduct. He was forced to suppress me at times, though not so often as he would have been justified in doing. Whether his lenience was due to tolerance or merely to weakness I cannot say.

Mention of psychology suggests a few dreams which belong to this period of my life. I cite them merely as amusing occurrences, for I attach no revelatory significance to dreams, and have no faith whatever in the grotesque interpretations of the Freudian "psychoanalytic" school.

In one of these dreams, the scene commenced with a titanic struggle between myself and another person—

my brother, I believe. We were hurling huge missiles at one another. By one of those sudden transformations, so familiar in dreams, we ceased hurling physical missiles and began to hurl arguments. I challenged my opponent with this poser (it was cited as an example of some "law" of Herbert Spencer's): "If a tablespoonful of nothing be dumped out of a window, why wouldn't it remain there?" Receiving no reply from him, I exclaimed: "There would be nothing to remain, you damned fool!"

Another bit of delirium cannot lay claim to such rigorous logic as the last one. Like many other persons, I presume, I sometimes had a distinct impression, while asleep, that extraordinary glimpses of truth were revealing themselves to me. These always eluded my grasp, however, at the moment of waking. If I could only drag one of these precious revelations out of the dream world into the full light of waking life, what an achievement it would be! At last I succeeded. I knew that I was close to the inner core of reality. I made a supreme effort and woke with these portentous words upon my lips: "So you see, it is not only a wolf but a scraper."

I doubt not that these cases, just cited, would find symbolic interpretations in the pornographic dream-code of the Freudians. All that such an interpreter seems to require is a taste for erotic speculations and a rather low minimum of ingenuity. Indeed, there are now standardized interpretations for so many of our more familiar types of dreams that it has become indiscreet to narrate one of these in a company of persons who have dabbled in "psychoanalysis." Almost any physical object, of whatever size or shape, is "symbolic" of either the male or the female genital organs, while various dreams of motion are a trick of the "unconscious" to disguise our desire for sexual gratification, normal or abnormal! The older, simpler, and more inherently probable physiological and psychological interpretations are replaced by these far-

fetched and often flagrantly absurd ones. All this on the basis of "evidence" so flimsy that an experimental biologist who should resort to such arguments would be laughed out of court. These are my deliberate views, after reading several books by Freud himself and some of his followers. I have a strong suspicion that much of the recent popular vogue of Freudian "psychoanalysis" is due to the freedom which it affords persons of both sexes to discuss sex matters under the cloak of seeming scientific respectability. It is the same urge which prompts so much of mankind (and womankind?) to revel in "smutty" stories, an urge which now at last may be gratified without the stigma of indecency.

The subject of dreams leads one naturally to that of hypnotism. Here I will introduce the reader to one of the picturesque figures in our state university at the time we are discussing. He was, among other things, dean of the college of dentistry—a very large man with a florid face and otherwise striking appearance, fond of giving public lectures, which were delivered with such a conscious air of authority that he passed among the students as profound. At least among the inexperienced ones. By many, he came to be regarded as a rank charlatan. He was certainly a fine phrase-maker, or perhaps he simply knew where to select his quotations. One of his *bons mots* was to the effect that "Life is not measured by the tick of the watch, but by the beat of the heart."

Dean X. was particularly fond of giving lectures on hypnotism ("with demonstrations"). Some of the students were used as subjects. In fact, for a time, he held regular seances at his residence, to which a number of us were invited. A few of my classmates appeared to fall under the spell very readily and displayed some of the typical automatisms and inhibitions. I myself was an altogether refractory subject. I was never able to pass into the hypnotic trance, although I was more than will-

ing to do so. Nor could I ever feel quite certain that the Dean's apparent success with my fellow-students was not due to their desire to cooperate with the host of the evening, rather than to any true hypnotic phenomena. Be that as it may, certain of the scientific men of our faculty freely charged that some of the results shown in public ("stigmata," etc.) were produced by fraudulent means.

Another of the truly picturesque characters at the university, during my college days, was the professor of rhetoric, Miss Maria L. Sanford, familiarly known to the entire student body as "Maria." She was at that time a woman in her middle fifties, with white hair, angular face, resonant voice, and an unmistakable aspect of spinsterhood. Her one great qualification as a teacher was her enthusiasm, and this was so great as to outweigh all her numerous personal peculiarities. Despite her noisy garrulity, and her amusing antics in the classroom, I think that her more serious students would acknowledge a considerable obligation to her. Maria was a dynamo of energy. She was catalogued as "Professor of Rhetoric and Elocution," but she was not content to move in such narrow confines as that. She strayed into the field of English literature, into the history of architecture, and I don't recall what else, and acted at times as if she held the chair of Things-in-General.

Miss Sanford had a rather extraordinary career. Already before I entered college, a petition had been presented—more than once, I believe—by students of the university, asking for her removal from the faculty on the ground of incompetence. She was regarded, even then, as senile. In my own time, there was considerable open disrespect for her. I recall how, in my senior year, a group of students bribed an Italian with a hand organ and a monkey to come into the old Main Building and stage a concert in the hallway, just outside of Maria's classroom door. A large crowd witnessed the perform-

ance with much appreciation, until another group of students emerged from Miss Sanford's room, and hustled the "Dago" out of the building.

But the extraordinary part of the story is yet to come. Fifteen years or more after I left college, I began to read in the papers in other parts of the country of the doings of "Minnesota's Grand Old Woman," Professor Maria L. Sanford. She appears to have been a much sought-for public speaker, with a wide circle of admirers. I myself had the pleasure of hearing her speak at the La Jolla Woman's Club as late as 1916 or 1918. She was at least eighty years old and still going strong! One's youthful impressions sometimes need revision.

I have already referred to a fellowship which was awarded me at the close of my senior year. This, if I remember rightly, carried a stipend of two hundred and fifty dollars. It was, I believe, the only fellowship which the university supported at that time. The appointee was expected to continue at the university for a year of graduate work. This I planned to do, and indeed I started to carry out the program. But the Fates willed otherwise. Upon the urgent advice of a physician, I postponed my graduate studies for another year, and went east to join my family. My parents had given up their Minneapolis home and moved to a small town in the interior of Maryland. Another curious migration!

My leaving Minnesota was doubtless a fortunate circumstance. A change of environment was clearly indicated. However, the physician's diagnosis which underlay this advice proved later to be quite unfounded. It served merely to dishearten me, and might well have had the most serious consequences. The physician in question was a homeopathist, whom my mother was accustomed to consult professionally. He was a fatherly old man with the best of intentions, but plainly incompetent as my narrative will show.

I had returned from the Itasca trip not at all rested. Exposure, inadequate diet, and at times overexertion, had left me in poor condition. The learned homeopathist was called in. He listened attentively for a while to my heartbeat (he did not use a stethoscope), and his face became grave. "Your heart is seriously affected," he said in substance; "it is enlarged, and besides that there is a murmur, denoting a roughening of some part of its inner lining. You must, for the rest of your life, avoid running, heavy lifting or strenuous exercise of any sort." This was at the commencement of my senior year. (I may remark parenthetically that I engaged in sports such as mountain climbing until I was past fifty. As one item, I climbed Vesuvius on five different occasions.)

Imagine the effect of such a verdict upon a young man, already the victim of "nerves," and disposed to brood over any alarming symptom! Harmless spells of palpitation now filled me with terror. I thought of the accounts in the papers of persons suddenly struck down with "heart failure." Might not this be my lot at any time? And so I brooded through my entire senior year, and for another half year after that. Not till then did chance lead me to the office of a real physician.

In the vacation following my senior year, I took a bicycle trip alone from Minneapolis to Chicago. Much of the road was wretched, so that I was obliged to walk and trundle my "wheel" along more than half of the time. I spent my nights in small hotels and farmhouses, and at least once in a barn. Rains sometimes held me up amid unpleasant surroundings for a day or two at a time. And thereafter, the roads might be too muddy for riding for another day or two. It was not a restful journey, nor—except in retrospect—a pleasant one. It was doubtless ill-advised at that time.

Not long after my return, the doctor again listened to my heartbeat. "A little heavier than before," he said

solemnly. And then followed the advice to leave the university and drop my studies for a year. This was good advice, perhaps, so far as it went. The difficult problem was to find some suitable occupation in the meantime. And this problem remained unsolved even to the end of that distressing year of "rest."

## CHAPTER VI

### ADRIFT ON LAND AND SEA

I went first to the little town of Westminster, Maryland, to which my parents had lately moved. My sister had shown evidences of lung infection, or so at least the physician had declared. Just why this rather isolated Southern village had been recommended as a favorable environment for her I do not know. My parents had no acquaintances there, and they remained unacquainted with anyone but the tradespeople during their year of residence.

My father's arm and shoulder had been crippled by a fall a few months earlier. His recovery from this fall was very slow. In fact, he really became more incapacitated, instead of less so, as time wore on. His locomotion became affected, and finally his speech and mental powers. It was not until these graver symptoms had developed, two years later, that we learned the true nature of his trouble. He was suffering from a degenerative disease of the nervous system. His injury was in no way responsible.

This was the home to which I came to recuperate for a year, before returning to my studies. Add to these things, the thought of the trusted physician's diagnosis: a heart that had to be forever coddled if I was to keep alive at all. I could not stand such a situation long. It was a month or two at most. Then I betook myself to Baltimore in search of a job.

Although I did not know a single person in that city, I had, at the outset, a curious confidence in my ability to obtain a job—almost any job, in fact, that I might ask for. With such a college record as mine, how could

there be any doubt about the matter? But I was to be promptly disillusioned. I looked through the "Want" columns in the local papers, heeding of course only those which related to the more desirable of the "white-collar" positions. Somehow, I was never considered seriously by the employers. Then I began to advertise on my own account, but with equal lack of success. Having had several years of chemistry in college, I offered my services as a chemist. One manufacturing firm did reply in this case, but the man at the desk did not seem at all impressed by my qualifications as a commercial chemist. Then I thought of my record as an essayist under "Maria," and decided to try my hand at journalism. I presented myself at the editorial office of the Baltimore American, and nonchalantly asked to see General Agnus. The General, needless to say, was "out." Nor did I succeed in making a date to see him.

Things began to look serious. Something had to be done. I "put my head together" for a while, and played at length what I thought was a trump card. I drew up a masterful letter, written ostensibly by one "Algernon S. Bleecker," setting forth in glowing terms the qualifications of a young man in whom said Bleecker professed to be interested. From a friendly disposed business man, in whose house I happened to be rooming, I secured the names of a considerable number of men who were prominent in various professions in Baltimore. I recall that Charles J. Bonaparte was one of these, and there were others of equal standing. Then I obtained the services of a typist, and had this letter of my friend Bleecker's copied in sufficient numbers. Return envelopes, addressed to "Bleecker," were enclosed with the letter.

Just why I resorted to this subterfuge is very difficult for me to understand as I look back upon the matter. There was no intent to deceive, or only for the moment, for I was prepared to explain the situation to any pros-

pective employer. That such tactics would seriously prejudice my case in the mind of any business man never occurred to me until I chanced to talk with one "prospect." This man had shown interest enough to ask "Bleecker" to call upon him, but when he learned the true facts of the case, he dismissed me rather scornfully. So far as I can remember, he was the one man who even suggested an interview. The others either sent "regrets," or did not reply at all. To repeat the pun of an acquaintance of the time, I grew "bleaker and bleaker" as the returns came in.

This all seems a joke now, but for me, at that time, it was something of a crisis. I was not, it is true, faced by destitution, for I could depend upon my father to pay my expenses. There are millions of men and women in the country at the present moment who are vastly worse off, economically at least, than I was then. But in my existing state of body and mind, such an experience was all that was necessary to discourage me completely. And along with this discouragement, my health further declined. I found myself travelling in a vicious circle. I must see a really good physician.

It was at this time that chance led me to the office of the celebrated Doctor William Osler. He was then head physician of the Johns Hopkins Hospital, as well as a private practitioner in Baltimore. However, despite his eminence, I had never heard of him. Dr. Osler was quickly able to dispel my fears regarding my heart: "You have no organic heart disease." The trouble was a considerable degree of nervous exhaustion, to be repaired slowly by suitable rest and recreation. For his careful physical diagnosis, the doctor would accept no fee. In fact, on the occasion of a second visit he good-naturedly pushed me from the door when I protested.

On Dr. Osler's advice, I tried two therapeutic measures, first, a stay of some weeks of "rest cure" at the

Johns Hopkins Hospital, and later a long sea voyage. Both contributed to my experience and my stock of interesting memories, but I doubt whether either had much of the anticipated curative value. The stay at the hospital, in particular, was far from auspicious. I had an inexpensive private room, adjoining one of the free wards, and here such of the ward patients as were allowed to leave their beds used to congregate in a neighborly way, to discuss their symptoms and express their opinions of the doctors and nurses. They were chiefly men of the laboring class, and were to a large extent chronic cases or incurables. The psychological atmosphere was hardly favorable to a neuresthenic patient. The monotony was relieved by the daily visit of the physicians, as they made their rounds of the hospital. I well recall Dr. Osler, with his deep voice, his long drooping mustache, and his serious, sympathetic features. And I recall Dr. W. S. Thayer and one or two others.

A few weeks of such "rest cure" were all that I could stand. Dr. Osler's next prescription was "a long sea voyage." "Go on a sailing vessel, rather than a steamer," he added. He suggested one of the coffee vessels, plying between Baltimore and Rio de Janeiro. And so it was arranged. One of my aunts provided the funds, and I secured passage on the bark "Amy," and sailed for Rio in the spring of 1895. It was spring in Baltimore, but late fall in the southern hemisphere. In those days, yellow fever was still rampant in the summer months, and the trip could not be safely made except during the cooler portions of the year.

The outgoing voyage lasted forty-four days. As usual, I was quite unprepared for this experience. Despite the inevitable dietary of old-fashioned sea grub, I did not even have a cathartic in my equipment. Rough weather faced us from the time we passed the Virginia capes and entered the open Atlantic. For the first three days, I was

confined to my bunk with seasickness of an exaggerated type. When I did finally stagger out onto the deck, I was still in a world of nausea—nauseous smells from the hold of the ship, and nauseous, frothy waves in every direction upon the ocean. And oh, that grub! I presume that the hale and hearty old sea dogs that we used to read about represent individuals with extraordinarily powerful digestive enzymes, capable of resolving the refractory messes which were fed to them. The others doubtless returned to the life of the landlubber or died a lingering death. In my own case, I suffered from indigestion during the entire voyage out, a circumstance which must have detracted greatly from its therapeutic value. The item of the cuisine which I remember most vividly was an ever-present jar of molasses on the table, in which the discerning eye could recognize the legs, antennae and other disarticulated parts of cockroaches. I don't know whether my messmates failed to see these or simply didn't care.

However, the voyage was an interesting one, and not altogether unenjoyable. I recall the days, if not weeks, during which we sailed through the patches of brown seaweed in the Sargasso Sea. At night, the flying fishes sometimes came aboard over the low-lying "gunnels" of the heavily-laden vessel. These were served to the passenger (I was the only one) once or twice for breakfast, a variation in diet which was much appreciated. I spent my time reading (chiefly *Les Misérables*), talking to the captain and sailors, making timid excursions into the rigging, and enjoying the beauties of the ocean, particularly at sunset. A favorite perch of mine was way out on the jib boom, from which I could look back at the vessel, which then appeared as a sort of tail to my kite. At night the vessel's prow cut a gleaming path through the phosphorescence, and swiftly-swimming fishes sometimes traveled in advance, clearly outlined in

the same glow. The captain once gruffly rebuked me for what he regarded as my foolhardiness in adopting this perch at night, but he did not order me to discontinue the practice and I did not.

Our captain was a character deserving of portrayal by a much more skillful narrator than I. Ignorant, opinionated, and unimaginative to a degree, he still had his soft spots. He was as far as possible from the drunken bully of the old-time sea story. I believe in fact that he was a total abstainer, and I do not recall that he ever spoke harshly to any member of his crew. The captain's home was in Hyannis, on Cape Cod, and he had a daughter who was to graduate from the local high school in June of that year. This impending event seemed to occupy his thoughts much of the time, and he made frequent references to it in his conversation. In fact, it had become something of a joke among the captain's acquaintances, as I learned later. Close to the end of the voyage, we were becalmed off the South American coast, and were waiting impatiently for a favorable wind to take us into port. The captain was musing one day. "Only two weeks more," I heard him say. "My Heavens!" I thought, "Are we still two weeks out from Rio?" But he added: "Till she graduates"—an immense relief to the passenger.

Aside from his little daughter, however, Captain B's interests were extremely mundane. He would talk untiringly of his favorite dishes on his table at home, but disclaimed scornfully any concern over natural beauty on land or sea. I remember his rejoinder to an exclamation of mine, called forth by a particularly glorious sunset. "That ain't going to help us down to Rio, is it?" And when we reached his destination, he seemed content to hang around the waterfront. Of the superb trip to the summit of Corovado, so readily reached by the tourist, he said with contemptuous emphasis: "That's a place I never had no desire to go to!"

I did not sail back on the *Amy*, but remained four or five weeks at Rio, and returned on another vessel belonging to the same company. These weeks were spent in seeing that wonderful city and its surroundings. The scene was an altogether new one to me — the tropical vegetation and the foreign architecture, culture and language. I had not been told that I was going to one of the most beautiful spots in the world. Only later, did I learn that this was the judgment of experienced travelers. To me the beauty came as an original discovery. But I did my sight-seeing absolutely alone. I knew no fellow-Americans whom I could consort with, though I could doubtless have found them had I made the effort. My one brief social contact was with the director of the Brazilian National Museum, a charming and friendly old German, who treated me, despite my years, as a fellow-scientist, and showed me the interesting collections under his care.

I purchased, rather foolishly, a metal tank and some gallons of alcohol, and had myself and my outfit transported to a rocky point on the coast. Here I endeavored to collect specimens of marine life. How could anything from Brazil fail to have a high scientific value? My attempt was not very successful. I presume that the tide was unfavorable, and in any case the breakers were running high. I recall the warnings of a native bystander, who endeavored to dissuade me from venturing too near the water's edge. When he discovered that I could not speak Portuguese, he tried to impress me with the danger of drowning by realistic pantomime.

Rio de Janeiro presented the same vivid contrast, which I later encountered at Naples, of human filth and squalor against a background of extraordinary natural beauty; of vice, indecency, and superstition in a population which gave evidence of a considerable degree of esthetic appreciation. Piety of a sort was conspicuously

displayed. One devoutly lifted his hat when he passed a church, even though his next act might be to make use of an unconcealed public urinal, affixed to the front of the sacred edifice. The same ritual of hat-raising was expected of the passengers in a tramcar, and this not only in passing a church, but whenever one of the frequent religious processions went by. I happened to be riding in a tramcar one day, when one of these processions passed along the street. Off went the hats—all except mine. I was not going to render obeisance to that debauched-looking file of priests! There were hisses and gestures from the other passengers. Then a Negro pedestrian boarded the car, which was an open one, and attempted to knock my hat off. I was told later than in Para, another Brazilian city, a foreigner had been stabbed for a similar defiance of conventions. Had these holy men given evidence of a little less holiness and a little more common decency, one might not have had so much reluctance in saluting them. But their features sustained their reputation for profligacy. The physician attached to the American consul's office, himself a former Catholic, told me that he frequently treated these men for venereal disease.

After a few weeks—four or five, I believe—in the glorious Brazilian capital, I took passage home on another vessel of the coffee fleet, a barkentine with auxiliary steam power. Her name, I believe, was "Severn." It was commanded by a very different type of captain, an urbane young Englishman who wore white duck trousers, and who paced the bridge, when the vessel was in harbor, in the uniform of Her Majesty's Naval Reserve. Also, there was another passenger this time, an elderly manufacturer from Rochester, New York, who was recovering from some sort of a "nervous breakdown." This passenger was an amiable enough old gentleman, though he became quite wrathful when I espoused the cause of

evolution one day at the dinner table. He indignantly denied that President Andrew D. White of Cornell was an evolutionist, and scornfully refused to consult White's "History of the Warfare between Science and Theology," to which I referred him.

I had purchased from an employee of my hotel at Rio two pets, a parrot and a fascinating little marmoset. The tiny monkey was a veritable little demon. Though no larger than a squirrel, he would savagely attack anyone who incurred his displeasure. He soon became reconciled to me, and would curl up inside the front of my shirt. But toward some of the crew he displayed an undying animosity. It is surprising, indeed, that I brought him home alive. No sooner had we passed out of the harbor of Rio de Janeiro and entered the ocean swell, than I was once more completely prostrated with seasickness. "Bijou," the marmoset, was free on deck. I was soon aroused by one of the officers, who warned me that I was likely to lose my pet unless I did something about it. I staggered out on deck to witness a ludicrous scene. The marmoset was high up in the rigging, chattering defiantly at a group of sailors, one or two of whom he had bitten. How we got him down I do not remember, but he had to be caged, pending my return to normal life.

Bijou had a particularly virulent dislike for the second mate, who took delight in standing near his cage and making grimaces at him. The marmoset would fall into a paroxysm of rage and inflict vicarious punishment upon a woolen sock which I had given him as a nest. One day, I was sitting in a reclining-chair on the afterdeck, Bijou curled up as usual inside my shirt. Suddenly, he became violently agitated and left me. I turned to discover the cause. Bijou had leaped from me to a cabin skylight, then to the shoulder of the second mate, whose ear he bit on the way, and then to the rigging of the ship. The

whole performance was so sudden that it was all over before anyone realized what was happening. And so Bijou once more escaped the death penalty.

After a brief but hectic career on shore, during which Bijou was a member of our household, I finally donated him to the Zoo in Central Park, New York. He doubtless succumbed before long to pulmonary infection. The parrot was given somewhat later to Dr. Bashford Dean.

The homeward trip was uneventful, and I proceeded from Baltimore to Summit, New Jersey, whither my parents had once more moved during my absence. Then followed a visit to the summer home of my aunt (my father's sister) in one of the far-flung suburbs of New York, along Long Island Sound. This was the commencement of an association which was to be of the utmost importance to me. I became, for a while, a protégé of my aunt's, and was, for several years, a member of her household, with consequences which I shall narrate shortly.

One of my aunt's first steps in my behalf was to send me to a New York physician, a specialist in nervous disorders, and a man of rather wide reputation in this field. Those were the days when "neurasthenia" was much in vogue, particularly among people who could afford this luxury. However interpreted, there were those to whom it was something very real. I was this man's patient, at intervals, for several years, and he did as much for me perhaps, as any man could. This despite his innumerable prescriptions—the various tonics and stimulants to digestion—none of which, I now suspect, had any therapeutic value whatever. But we talked together about a great variety of topics, and he listened attentively to my own analysis of my symptoms. I would go to him depressed and come away encouraged, which was probably worth all that he received in fees. One bit of advice, in particular, proved to be of the utmost value. He promptly told me to go back to university work. No

more "rest cure" for me! And so it was arranged that I should enter Columbia University as a graduate student in the coming fall.

## CHAPTER VII

### NEW YORK CITY AND COLUMBIA UNIVERSITY

My aunt's New York house was in the "thirties," between Broadway and Fifth Avenue. Hers was a "brownstone front," identical in appearance with thousands of other "brownstone fronts" in this and hundreds of other blocks in the city. Save for my brief sojourn in Baltimore, my experience had hitherto been with three-dimensional houses, whose owners were able to express their esthetic preferences or proclaim their social status through the medium of architecture. It took me some time to realize that these monotonous and unpretentious exteriors sheltered, in many cases, families of wealth and culture, indeed, that only families of considerable wealth could afford to own such dwellings at all.

My New York aunt did not regard herself as rich. Very few persons of wealth so regard themselves, I believe. And indeed, many of her friends and some branches of her own family were much more wealthy than she. However, she kept three or four maids, and at her country home, a coachman in addition. With her were two of her daughters, my cousins. Her four other children at that time lived elsewhere. All were older than I, with one exception much older.

Shortly after commencing my studies at Columbia, I joined this household. And it was a great privilege. My aunt and cousins adopted me into the family and treated me with rare kindness and consideration. I am sure that my social inexperience and conspicuous lack of adaptability and poise must have been a frequent source of embarrassment to them. But they seldom betrayed such feelings. They thought they saw possibilities in me and did their best to develop them.

These relatives of mine, inside and outside of my aunt's household, were for the most part persons of exceptional worth. They were both intellectual and artistic. Several of them were accomplished pianists. All were highly educated, at least so far as the "humanities" were concerned. While they retained many of the mid-Victorian taboos regarding "propriety" in conduct and speech, they were on the whole charmingly natural and unconventional.

Though "comfortably off" or better, the tastes of this group were simple, and they took very little part in what the newspapers call "society." For all that, most of them, as I recall, were listed in New York's "Social Register" of that day. In recent years I have been surprised to learn through the press that inclusion in this little address book implies membership in a sort of American peerage!

Of course all these people viewed things from the standpoint of their economic class. Ladies were ladies, and servants were servants, and the gulf between the two was always kept in view, even in conversations when the servants were present. And for their part, the servants wholeheartedly accepted the distinction. The word "gentleman" seems to have commonly denoted a certain social status, and to have had little reference either to deportment or to morals. I remember being out on Fifth Avenue rather late one evening with one of the ladies of this circle, when we chanced to pass a silk-hatted man of the "clubman" type, reeling along very unsteadily. "Too bad!" my companion exclaimed, "and a gentleman, too."

I need hardly add that nearly all the discussions which I heard during this period of my life took for granted the righteousness of the capitalistic regime, and of existing inequalities in the distribution of wealth. Organized charities were adequate to take care of the "worthy" unfortunate. In those days, the leaders of fi-

nance and the captains of industry still tended to be our paragons, not only in respect to ability but to social worth. How else could they become leaders? Attorneys General and Senatorial Investigating Committees had not yet exposed the knavery and shortsighted stupidity of some of these great men.

Enters now upon the scene our queer young nephew and cousin from the Far West. He needs civilizing and humanizing; he needs to be educated. He may know a little, perhaps, of invertebrate morphology, or the theory of natural selection, or of textbook psychology, but his ignorance is none the less abysmal. He has never even heard of Walter Pater or John Addington Symonds, of Donatello or the della Robbias. He doesn't know a "Concerto in E Major" from a "Sonata in G Minor." He cannot respond without awkwardness to an introduction, or take in a lady to her place at the dinner table. Worse yet, he is far from being an apt pupil in such matters, and is even disposed to make light of his shortcomings and to ridicule social conventions in general. As a conversationalist, he is almost a total loss. He is either helplessly silent when everyone else has something to say, or talking when it would have been wiser for him to remain silent.

That I was, too, an "absent-minded professor" in the embryo will appear from one amusing if trivial escapade of mine. I was out walking with one of my girl cousins, in the pre-automobile era, when walking about the city streets was an accepted and altogether proper form of exercise for both sexes. We were on Forty-second Street, near the Grand Central Station. I was carrying a neatly wrapped parcel, to be left on the way at a laundry agency in a haberdasher's shop in that neighborhood. To enter a haberdashery, even with an escort, was not, of course, allowable for a young unmarried woman of the Victorian era. So my cousin proceeded slowly along the way, wait-

ing for me to catch up with her. I hurried into the shop, left my package with a clerk, picked up a derby hat from the counter—for some reason thinking that it was mine—and with equal haste made my exit. Subconsciously aware that I already had one hat on my head, I continued to hold the other in my hand. Once out of the shop, I broke into a run to overtake my cousin, who was, by this time, some distance ahead. Fortunately for both of us, I awakened to the ludicrous situation before I was pursued by a policeman, and caught with the goods, in an all too obvious act of shoplifting. The situation would have been difficult indeed to explain.

I never realized at the time the extent of my relatives' patience with me during those years. Nor were their efforts wholly in vain. They took me far too late, it is true, to "civilize" me, even if such a thing had been possible. But they, nevertheless, helped me to overcome some of my most conspicuous social handicaps, and so gave me a fairer start in life.

I voluntarily abandoned this valuable association about midway in my course as a graduate student. A case of unrequited love for one of my cousins led me to withdraw from the household.

This matter of social handicaps I cannot yet dismiss from my narrative, even though I may seem to indulge in an indecorous bit of psychological exhibitionism. I have already recorded that I was morbidly bashful in my boyhood. As one consequence, I grew up with very few girl acquaintances. My fears were not restricted, however, to the opposite sex. I was apt to display an exaggerated shyness in the presence of older persons of either sex, this taking the form of intense self-consciousness, awkwardness and blushing on slight provocation. Later, to my great mortification, more marked symptoms, such as trembling, appeared, which were but slightly subject to voluntary control. Naturally these symptoms were

more pronounced in the presence of some persons than others, and they varied greatly from one time to another. This disability was a serious inhibiting influence throughout much of my life, and it has never been entirely outgrown. Embarrassment and mortification are emotions which loom large among my life's recollections.

I have no doubt that the word "erratic" has been freely applied to me, and I shall not altogether dispute the fitness of this characterization. My moods have often fluctuated rather violently, and my reactions to similar situations have varied widely from one occasion to the next. I have displayed unaccountable inconsistencies in my behavior toward the same person. And my expressions of opinion have doubtless fluctuated between thoughtful, well-worded judgements and altogether reckless vociferations.

How often in my life have I had the experience of winning a certain degree of admiration from someone, only to repel him (or her) when another of my psychophysical patterns gained ascendancy! Neural fatigue, with its resulting release of inhibitions, sooner or later spoiled the picture. Such experiences, indeed, made me increasingly hesitant to enter into new friendships. However, I think I may fairly insist that these inconsistencies were not so fundamental as they may have seemed. They do not imply such hopeless instability as some have perhaps inferred.

As in the case of many persons thus afflicted, these feelings of inferiority tended to be compensated by intervals of self-assertiveness and loquacity, which may readily have given the impression of vanity and egotism. Call this an "inferiority complex" if you wish; that is, if you don't mind resorting to a rather threadbare expression.

Early in my adult life, I discovered the well-known courage-promoting properties of alcohol, and it was long my practice to drink moderate amounts of some alcoholic

beverage, preceding an occasion when I wished to be "myself." This I did, for example, when interviewing some person whom I regarded as important, or reading a paper at a scientific meeting. (Let me remark that I never allowed myself such a heavy dose as the half-gallon of ale with which the redoubtable John Ridd fortified himself before being presented to his sovereign.) Owing to this rather frequent appearance with liquor on my breath, I think it likely that I gave to some the impression that I was a heavy drinker, but this has never been the case.

The tempo of my mental machinery, which is slow at all times, may be reduced to almost the zero-point at a moment when quick thinking is called for. And yet, *mirabile dictu*, I am really gifted with exceptional powers of repartee. It is true that no one but myself ever suspected the fact. But I know! I know that from a few minutes to several hours after the fitting occasion has passed by, I think of some conclusive answer to an argument, or fitting retort to a joke, or withering reply to an insult, which would have left the advantage all on my side. But time is an important factor in most of the affairs of life, and thoughts of what might have been are seldom consoling.

One unfortunate result of this shortcoming is that I am likely to be debarred from effective participation in any group discussion, even though this relates to some topic in which I am greatly interested and concerning which I may be as well informed as anyone present.

After these last derogatory remarks regarding myself, it is only fair that I should be allowed to add a few words of self-appreciation.

Save, indeed, for this woefully slow tempo, I believe that my mental machinery functions well above the average. With more quickly working neuro-motor processes, and a more ready recollection of things which I actually know, I could possibly match my wits with any but really

first-class minds. (Fortunately for me, perhaps, this boast is one which can never be put to a test!)

I think that my scientific colleagues are probably right in crediting me with more than average literary skill in the presentation of my technical contributions. This, to be sure, is not a very boastful claim, for the average of literary excellence among scientific workers seems to me rather low. However, I believe that such superiority as I have shown in this direction consists in something more fundamental than the mere careful choice of words and skillful construction of sentences. I think that I succeed rather well in picking out the essentials of a situation and setting them forth clearly and logically. In fact, I am likely to experience a distinct feeling of dissatisfaction until this is done, though it is not often that I succeed in the first attempt. Thus my writing, even the writing of an unimportant note, is apt to be a painful trial-and-error performance, in the course of which I scratch, substitute, transpose and interline, until I am satisfied with the result. Such success as I attain in these directions results from this persistent effort, and not from any ready flow of words or ideas. Naturally, I write vastly better than I can speak. What I say—speaking extemporaneously—consists of these unrevised gropings. (Believe it or not: the foregoing unimpressive paragraph required rather more than an hour of my time. But I am not always so dumb!)

However, I am straying a long way from my university career.

It was six years from the time of my first registration as a graduate student at Columbia University until I received the degree of Doctor of Philosophy in 1901. During the last two years of this period, to be sure, I was teaching elsewhere and devoting relatively little time to work for my degree. However, my progress toward the supreme academic goal was rather slow at best. I

had chosen as my major subject zoology, the science of animal life. But I was soon disappointed and repelled by the extent of the descriptive detail which the student was expected to master, and the seeming pettiness of the problems which were offered him as topics for his research work. Cytology, the sub-science of the cell, was then in the ascendant, and most of my fellow-students seemed content to lay out a program of several years' work, investigating, for example, such matters as details in the structure of the cell or in the mechanism of cell-division.

I was offered at one time a series of vials, containing the eggs of a certain marine worm, which had been preserved at proper intervals to reveal the succession of cleavages by which the originally single ovum resolves itself into a many-celled embryo. The puzzle to be disentangled was the exact history of all these various cleavages, and thus the complete pedigrees of all the resultant cells out of which the embryo develops. "Cell-lineage," this was called. In the hands of a few pioneers in this field, such studies had yielded results of great importance and interest. But why go on repeating the drudgery, when the harvest had already been gathered? I was appalled. If this was what advanced work in biology meant, I was done with it.

At the close of my first spring semester, accordingly, I definitely planned to abandon research in biology and to commence a medical course in the fall. I recall that one or two of my relatives—though not all of them—hailed this change of heart of mine as a step in the right direction. As a physician, I should be working in the service of humanity. The mere quest for knowledge seemed too largely a selfish pastime. Such an attitude toward scientific research is still widely prevalent.

But the medical course was never commenced. I reversed my plans once more during the summer vacation, and returned to work in the fall with improved

health. Under the kindly encouragement of Bashford Dean, I once more found myself interested in my old friends the fishes. I became particularly interested in watching their development from the egg. My research problem, I decided, would be the development of the catfish—*the whole development*, forsooth. I was not going to be content, after the manner of my associates, with any single phase or detail of this development!

To a layman in biology, even the entire life history of a single species of fish will seem a hopelessly restricted subject of interest. To a specialist in embryology, on the other hand, it will seem a vast field of inquiry—far too vast, in fact, for a doctor's thesis. And so it proved to be. My intensive efforts had to be limited, after all, to certain brief stages in the early life history of fishes. It is likely that my thesis, "Kupffer's Vesicle and its Relation to Gastrulation and Concrescence," was as highly specialized a production as any which was offered by a candidate for the doctor's degree the year that I received my diploma.

I had learned through several years' experience something of the limitations of the individual investigator, and I came to realize that even petty details may be highly interesting when viewed in their relation to a greater whole. But above all, this topic of investigation was one which had gradually evolved in my own mind. It had not been offered to me ready-made. Nor was it chosen because someone else was doing something closely similar.

This matter of the choice of "problems" for scientific research is itself a problem of great importance. One can give excellent reasons for following the crowd in making his choice. A field which has already yielded valuable returns may reasonably be expected to yield further ones. It is in the direction of least resistance. The problems have already been defined and the technique developed. Then too, one is more likely to achieve prompt

recognition of his labors—a consideration of supreme importance for a beginner. On the whole, it is the only safe course for persons of limited originality, and that means most of us.

A totally new lead, on the other hand, is a venture, with the odds commonly against one. Months or years may be spent, only to reach negative results, or worse yet results which are largely inconclusive and meaningless. But think of the dazzling successes which occasionally reward the more fortunate! In science, as in other fields, we have the pioneer and prospector. Such a one is not content to follow the herd. He would rather roam the trackless desert alone than ride on the band wagon. When this restless spirit is combined with exceptional insight, we may expect great results. But the average prospector, whether in science or in mining, never finds much "pay-dirt."

My own temperament has been largely that of the prospector. I have shunned the crowded thoroughfares in science, as I have shunned them in the other walks of life. I might never be able to achieve much, but the little I did achieve would be mine. And like many another prospector, I have been a gambler. I have frequently played for high stakes, and needless to say, have often lost heavily. This has naturally not tended to make me contented. But I should have been even less contented doing the goose step, along with fellows engaged in exploiting some current scientific fad. There has plainly been a maladjustment between my ambitions and my capacity for achievement.

The leading biologist at Columbia, in the days of my studentship and for long after, was Edmund B. Wilson. Morgan had not yet arrived there, with his *Drosophila* cultures and his new insight into heredity. I think it likely that Wilson would have been voted at that time the foremost biologist in America, had the matter been

put to a nation-wide poll of his scientific colleagues. He certainly was the leading authority of his day on the phenomena of the cell. It is possible that Wilson's pre-eminence lay in his scholarly thoroughness and soundness of judgment, and in the meticulous care with which he worked rather than in any high degree of originality in breaking new trails. Or perhaps he merely did not have the good fortune to be born on time to be one of the pioneers in cytology.

Aside from his scientific achievements, Wilson was admired for the clarity and literary excellence of his lectures and writings, and his charming personality. He was an accomplished musician and a man of exceptional culture in various ways. Among the younger men the feeling was often expressed that Wilson belonged to a different order of beings from the rest of us. Our only criticism of him was that he neglected to exercise his almost superhuman influence over his students more freely. The slightest display of interest in one's work, on Wilson's part, was enough to put one in high spirits for the rest of the day. Yet such attentions were not very freely bestowed on most of us. This may have been due, in part, to his modest unawareness of the pedestal on which he stood in the eyes of his students.

One of Wilson's contemporaries, at that time the head of the Zoology Department, is far less easy to evaluate, at least in candid terms. To us students, as I have already stated, Wilson was the leading man of the department. Osborn was a not very close second. To the country at large, the name of Henry Fairfield Osborn was doubtless by far the more familiar of the two. Public activities, popular writings and extensive publicity created a widespread Osborn tradition, and a belief in some quarters that he was one of the outstanding scientific men of this continent. In this belief, we may add, Professor Osborn seemed to fully concur. Indeed, he was

honored as few American scientific men have been honored. His supporters pointed to Osborn's massive and finely executed monographs upon various groups of extinct mammals, and to the vastly important services which he rendered to science in developing the American Museum of Natural History. His critics replied that his scientific achievements were only rendered possible by a large personal fortune, and that his writings abounded in obscurantism and purely verbal solutions of major problems. A fair evaluation of Osborn would doubtless concede some truth to each of these conflicting viewpoints. I must here personally acknowledge considerable friendly interest on his part in my later scientific activities.

One man to whom I owed much during this period of my life was Bashford Dean. I think that it was he more than any of the others who rescued me from discouragement and disgust with biological work on the occasion which I have recorded. Dean showed a much greater degree of personal friendliness toward his students than any other man in the department. His home was thrown open to us freely, and there we had the privilege of meeting various biologists of prominence as our fellow-guests. I am sure that those evenings at Dean's stand out conspicuously among the pleasant recollections of all of us who were privileged to take part in them. It was Dean, more than anyone else, who backed me in various substantial ways while I was a graduate student at Columbia, much as Nachtrieb had done during my undergraduate days at Minnesota. Among other things, he obtained for me a special summer scholarship at Cold Spring Harbor, and later the opportunity to go on a collecting trip to Africa, as I shall soon narrate.

Dean's talents were manifold. As an illustrator of his own scientific papers, he could rival any professional draftsman. In at least one case that I recall he prepared his own lithographic stones. He was a connoisseur of

armor and, being a man of wealth, he accumulated quite a collection in his own home. But versatility has its risks, especially in a man of science. That it was a serious handicap to Bashford Dean I think can hardly be doubted. Some of Dean's earlier writings brought him widespread recognition as a biologist of promise. But he became more and more engrossed in interests which were originally mere hobbies, and his biological activities waned proportionately. His services to his students lay in the direction of friendly personal help, rather than in scientific guidance. But these services were highly important to some of us.

Of my fellow-students in Zoology at Columbia, there are only a few whom I have seen in later life. Chief among these are J. H. McGregor, best known through his sculptured restorations of primitive man, and two of our leaders in neural anatomy, C. J. Herrick and O. S. Strong.

Two "minor" subjects of study were then required of the candidate for the Ph.D. degree at Columbia. It was but natural that I should choose Psychology as one of these. Aside from my previous interest in this subject, it would be a special privilege, I thought, to work under James McKeen Cattell, one of the first psychologists in the world to apply laboratory methods to the investigation of mental phenomena.

Most of Columbia's departments—and among them Psychology—were still housed in an old group of buildings on Madison Avenue in the upper "forties." The quarters of the Psychology Department were disconcertingly close to the yards of the New York Central Railway, in the rear of the Grand Central Station. Those who have heard Cattell's public lectures will appreciate what a poor competitor he must have been, when judged by merely auditory standards, with the noisy freight engines which puffed through the yards at frequent inter-

vals. His lectures were delivered in a monotone from which he rarely varied, and were naturally not easy to follow in these circumstances. Fortunately, however, Cattell exerted a far greater influence outside his lecture-room. He was a man of independent judgment, not at all prone to adopt the prevailing mode in the ideas which he accepted. He held to some of these ideas and principles of action with grim determination throughout a long and active life. Behind a mask of seeming indifference, he concealed a fund of energy and administrative ability which was a great asset to American science during the past four or five decades. And as a fighter of shams and false standards: ask the man who took advantage of war hysteria to force him from his position at Columbia University!

One of Cattell's headlights of research was the study of individual differences according to quantitative methods. I became interested for a time in the subject of belief and, at Cattell's suggestion, prepared a list of twenty-five questions, to be answered "Yes" or "No," and admitting of all degrees of certainty in the reply. This last ranged from complete uncertainty ("Is there an even number of persons in New York City?") to complete certainty ("Do two plus two equal four?"). Intermediate in the scale were such questions as: "Is evolution a fact?" and "Will the most honest man you know be honest ten years hence?" The subjects of the test were to arrange their answers to these questions (regardless of whether affirmative or negative) in the order of the confidence with which they were given. My own subsequent treatment of this material consisted in computing averages for the positions of the various answers as given by the hundred persons who had cooperated with me in the test, and in subjecting the results to some of the other statistical tricks, by which dry data may at times be forced to yield conclusions of interest.

Perhaps as a mere gesture of encouragement, Cattell seemed disposed to attach more importance to this youthful adventure of mine in the field of questionnaire analysis than I was myself. There were several serious flaws in the method employed, and these were, indeed, fully recognized by us at the time. Most serious of these flaws was the impossibility of distinguishing one's subjective feeling of certainty, in affirming a proposition, from the proposition's logical cogency. For example, I presume that as a mere matter of belief the proposition "The sun will rise tomorrow" carries as high a degree of conviction as the proposition "Two plus two equal four." Logically, they stand on a different footing, and accordingly, in the returns from my questionnaire, the answers to the questions had average position of sixth and first, respectively. Then too was the difficulty, inherent in most questionnaire studies, of framing a series of questions which will be entirely unambiguous. Later experiences in answering the questionnaires of others have impressed me with the magnitude of this difficulty.

However, Cattell's stress upon the quantitative study of individual differences was of influence, I am sure, in my later extended application of this technique to the study of variability in animals.

One field of inquiry to which Cattell's mind appears to have been definitely closed was that of "psychical research." The entire field of "supernormal" phenomena, whether interpreted in terms of spiritualism or telepathy, he definitely rejected as unworthy of scientific investigation. I was, at that time, much impressed by some of the reports of the English Society for Psychical Research, as well as by the American investigations of Mrs. Piper by William James and others. After a somewhat extensive perusal of the evidence, I was led to admit that James was justified in his conclusion that the "medium" (or her "control") might be "acquainted with facts about

the circumstances, and the living and dead relatives and acquaintances, of numberless sitters whom the medium never met before, and of whom she has never heard the names." The more recently published studies of Rhine and others at Duke University and elsewhere seem to furnish strong additional evidence for the reality of "extrasensory perception." This evidence, it is true, has not proved convincing to the majority of professional psychologists, and there are features of it which are calculated to cause most scientifically trained men to suspend judgment.

It would have given me much satisfaction at that time to have a part personally in investigations of this sort. I sounded the possibility of arranging seances with Mrs. Piper through a friend who was acquainted with that lady's father-in-law. But Mrs. Piper had placed herself in the hands of one group of investigators to the exclusion of all others.

I visited William James, to whom I had been introduced by one of my Cambridge relatives who knew his family. The great philosopher received me very cordially, and invited me to lunch at his house. I spent a very interesting hour or two with him. In response to my inquiry, he suggested the names of several "mediums" of whose alleged powers he had heard recently. One of these was a blind woman at Chelsea. I visited her forthwith, but was chiefly impressed by her persistence in endeavoring to extract information from her client—information which she somewhat later announced triumphantly as her own independent discovery.

A visit a few days later, in New York, to another "medium" suggested by Professor James, led to more striking results. The first part of the seance was very much a repetition of that with the blind woman. Finally, I thought of a promising test. "What were the last words of my friend who died lately in a far away country?" It

startled me not a little when she replied "He says it is cold, very cold." It happens that the friend referred to was Nathan R. Harrington, who died during our sojourn in the Egyptian Sudan in the summer of 1899, as will be described in the next chapter. It was midsummer in a land of high temperatures. Even in the delirium of his dying hours, Harrington was impressed by the contrast between his own death chill and the fierce heat of the country we were in. He kept repeating: "Cold, cold . . . impossible to believe . . . Sudan cold!"\* His limbs were cold to touch, and the death-sweat rolled off in streams. However, when I asked the medium why my friend said it was cold, she replied: "He is far north, in the Arctic regions." If any believer in spirit communications is impressed by this episode, he is welcome to his own interpretations. At the most, I think, we should need only to invoke telepathy. But I believe, as I believed at that time, that the "medium's" repetition of Harrington's words was probably a mere coincidence. The chill of death is after all an only too familiar phenomenon.

\*See page 129.

## CHAPTER VIII

### AN EXPENSIVE FISH

This trip to the Egyptian Sudan deserves a chapter by itself. It happens that I kept a rather full diary at the time and this, except for deletions of irrelevant matter, I shall reproduce almost exactly as written. Why this narrative was so carefully written during the strenuous days of that expedition I do not altogether remember. It is obviously a mere record of our experiences, with no claim whatever to being a narrative of scientific observations. Of these we admittedly made few. The reader will, I hope, appreciate the reasons for this failure. I believe that I drew upon this diary rather extensively in composing my letters to my family and friends, but I do not recall any intention to publish it.

A certain amount of preliminary explanation is necessary. This expedition was the outcome of an attempt to throw light upon a technical biological problem, the question of the immediate ancestry of the land-living vertebrates. Reasons had lately been offered by comparative anatomists for believing that the fishes which most nearly approached the amphibia in essential structure were represented by the African *Polypterus*. In view of the flood of light which has often been thrown upon an animal's relationships by a study of its life history, it seemed a vital matter to secure the developmental stages of *Polypterus*. This was in the days when solving the questions of animal phylogeny seemed far more imperative than it does to the biologists of 1945.

Now *Polypterus* was known to occur in two regions of Africa, the deadly "West Coast" district of the Senegal and Gambia rivers, and the upper (southern) section

of the Nile. In the summer of 1898, the Zoology Department of Columbia University sent out a party consisting of Mr. Nathan Russell Harrington and Dr. Reid Hunt, in quest of this fish and its young. The Nile, rather than the West Coast district, was chosen as their objective, chiefly because of the smaller risk from tropical diseases in the former locality. It happened that this was the year of the final Anglo-Egyptian campaign against the Khalifa, successor to the Mahdi, culminating in the recapture of Khartum. Military conditions consequently prevented the party from ascending the Nile. But preliminary skirmishing was carried on, and information acquired which would be useful in the event of a later attempt.

In the following year, funds were obtained for a renewal of the Columbia venture, chiefly through the generosity of Mr. Charles H. Senff, a friend of Professor Osborn. This time, I was included in the party, thanks mainly to the influence of Dean. It was known that an Englishman, Budgett by name, was preparing to enter the Senegambia region that summer on the same quest. The affair began to look like an international race.

A factor of uncertainty in our enterprise was the possibility of our not being able even then to ascend the Nile far enough to obtain our material. Beyond Assouan, at the First Cataract, the whole country was still under military control. Indeed, after our arrival at Naples, the prospect of our getting through the military lines became so uncertain that Hunt and I made arrangements to work at the Zoological Station and to leave *Polypterus* out of our reckonings. But an unexpected telegram arrived from Harrington, who had gone ahead to Cairo on the forlorn hope of being able to wheedle a permit out of Lord Cromer: "You better come." I shall continue from my diary. (The first of these entries is dated Friday, July 7, 1899.)

\* \* \* \* \*

I was standing at my newly assigned table, talking over some intended experiments with Dr. Paul Mayer, when Hunt stepped in and handed me the message. For the moment, this new turn of affairs was very nearly a blow to us both, but the feeling did not last long. It was four o'clock when Hunt brought the telegram to the laboratory. At midnight we boarded the Dampfer "Kaiser" of the Deutsche Ost-Africa Linie, bound for Port Said. I shall never forget Eisig's (the acting director's) farewell to us in his broad German accent, sincere and cordial, though very formally worded. "In one way I am sorry you are going, but in another way, in as much as you are going to carry out your original purpose, I am very glad."

The Kaiser was a particularly neat and well kept vessel, the food good and the officers intelligent and agreeable. The passengers were nearly all Germans and Portuguese, bound for the East Coast of Africa. The nights on the Mediterranean were delightful, there being a full moon and the sky invariably clear. On Saturday the 24th we passed Crete, whose snow-topped mountains were in sight throughout the whole day. . . .

On the morning of June 26 we landed at Port Said. No one from ashore was allowed to board the "Kaiser" on account of the bubonic plague then existing in Egypt. The plague did not alarm us in the least, however, for it was confined to Alexandria, and the Captain's precaution was doubtless merely for the sake of escaping quarantine at the next port.

At Port Said, I got my first glimpse of the East. But it is an upstart town, more European than Egyptian, and with very little interesting or picturesque about it. During the winter season, it is said to be a hotbed of vice, but there was little indication of that now with the exception of an Arab boy here and there who offered to show us some of the unmentionable sights of the town.

At 3:50 P. M. we boarded a train for Cairo. We had just taken our places in the car when Hunt recognized upon the platform a friend of the preceding summer, a Copt named Basili Effendi Irian who is Concessionaire des Pecheries at Damietta. This gentleman stepped into our compartment before seeing Hunt and then a warm greeting took place. The meeting was rather a curious coincidence, for Basili Effendi was one of the few persons in Egypt whom Hunt knew.

After about an hour's ride, we passed the "Kaiser" on her way through the Suez Canal. We waved our handkerchiefs to our friends on board and the salutation was returned.

Reaching Cairo at about 11 o'clock that night, we were met at the station by Harrington, who took us at once to the Savoy Hotel. Permission had been given us to go as far as the Atbara, apparently only after some little diplomacy on Harrington's part.

We remained at Cairo till Friday, or at least the others did. Nearly two days of my time were taken by a trip to Port Said for the purpose of getting our goods through the customhouse and bringing them up to Cairo. On account of this and certain preparations for the journey, I did not have much time for seeing the Egyptian capital. But I did take a ride out to the Pyramids one night with Hunt, by the light of a half-moon. Baedeker is right in saying that the trip by moonlight is one which leaves "an ineffaceable impression." Certainly everyone ought to get his first view of the Sphinx by moonlight. And the view from the top of the Great Pyramid at night is magical. Even the Arabs who helped me up [Hunt had been up previously] had the decency to talk quietly and cease pestering me for "backshish." But as a rule half the charm of visiting any of these monuments of antiquity is destroyed by the beggarly natives who refuse to leave the traveler alone for a moment. Now

it is the "guardian of the ruins" who demands a fee, now a fellow who volunteers some piece of information and then pesters you for his reward, and again it is a miserable little brat who tries to force spurious antiquities upon you. The dragomen affect a pedagogic tone and solemnly tell you the rarest hodgepodge of truth and nonsense. We learned to our amazement that the nose of the Sphinx had been shattered by *Roman* cannon, and other equally startling facts that I cannot recall.

On the morning before our departure, Hunt and I rode out to the Gizeh museum to pay our respects to Rameses II and other noteworthies. I was much interested in seeing the original of a wooden statue, a copy of which I had seen in the Boston Museum of Fine Arts and had been much impressed with at the time. It is known in Arabic as the "Shekh el Beled" (village chief) and dates back to the Ancient Empire. There is nothing at all, in the figure or features, of the stiffness and conventionality so characteristic of Egyptian statues. The face, when I first saw it in Boston, reminded me at once of that of Col. Robert Ingersoll.

On the 30th of June at 9:30 P. M. we started by train for Luxor. We had a compartment to ourselves and managed to pass a pretty comfortable night. But the next day was pretty hard to bear. Bennet Burleigh, in his book "The Khartoum Campaign," says "Of all the terrible railway journeys in the world for dirt and discomfort none can compare with that from Cairo to Luxor and Assouan." It was very uncomfortable, to be sure, but we found it far from unendurable. The heat by itself was not very distressing, but the atomized dust of the desert came into the car windows in clouds, saturating us and covering everything we possessed. Our time was spent in the vain endeavor to quench an unquenchable thirst by drinking gallons of muddy Nile water. Ice, of course, was out of question. Drinking water in these

parts of the world is kept cool by standing in porous earthenware jars (goulahs), the low temperature of the water resulting from the rapid evaporation of the moisture which oozes through to the outer surface.

We reached Luxor early in the afternoon. Here we were to wait until the following morning when we should take the narrow-gauge cars to Assouan. Having the afternoon at our disposal, we started out soon after lunch to visit the vast ruins at Karnak and Luxor. Of course we rode donkeys. These Egyptian donkeys are spirited little beasts and are capable of striking a pretty good pace. It seems rather inglorious to be run away with by a jackass but this is what happened to Hunt one day at Cairo. He was thrown, too, and received quite a bruise.

To spend but an hour or two among the ruins of Karnak is simply tantalizing. One goes away with a bewildering impression of walls and pyla, columns and obelisks. My interest in Karnak was heightened by the fact that during my college days it was once given me as a topic for an essay in the rhetoric class.

At Luxor we were joined by two fellow travellers, one of whom has been with us ever since. This latter is a sergeant in the Thirteenth Sudanese, a powerfully-built young Englishman with a marked trace of cockney in his speech. A decidedly bright and intelligent young fellow, we have found him pretty good company. He is just back from a visit home, stocked with all the latest from the London music halls, and our idle hours (24 per diem) are cheered by songs charged with sentiment that would touch a heart of stone. As little a puritan as the rest of his cast, he speaks of his own amorous propensities with charming naïveté. But the least virtuous are not always the least manly and we have really taken quite a fancy to our easy-going young friend with his un-failing good nature and original brand of humor. He is a genuine Kipling character, the original "Sergeant What's

His Name." Last night he sang that song with very good effect and we all wished that we had it in our power to make him a Bey on the spot.

But to return to our journey. We arrived at Assouan on the evening of Sunday, July 2, too late to get a really good view of the temple at Philae, which we saw, however, by twilight.

Our expedition being permitted by courtesy of the War Department, we were looked after more or less and our comforts provided for. At Luxor we had been met by the commandant, a native Bey, who gave us all necessary assistance, and at Assouan we learned that word had been wired, giving orders for our comfortable passage on the river.

We boarded the steamer "Tanjore" that evening and before midnight were on our way up the great river. Most of us preferred sleeping on deck as the air of the staterooms was suffocating. In the morning we were wakened by the glare of the tropical sun shining full in our faces. This river journey was only a matter of about 220 miles, but it took us four days to reach Wady Halfa. The Nile steamers are little stern-wheelers. They invariably take in tow four small sailboats (giassas) which are lashed alongside and retard the vessel's progress greatly. Above Assouan, Egypt as a habitable country well nigh disappears. On either side of the river lies a narrow strip of green, often scarcely a hundred yards in width, beyond that the scorched and barren hills, where the river valley ends and the desert begins. But the journey, for all its monotony, was full of interest. Even this desolate region is inhabited and we passed innumerable little villages of mud-built houses. Happening one morning to wake at five o'clock, I got a good view of the façade of the famous rock temple of Abu Simbel which we were at that moment passing. One of the sunsets which we saw from the river was among the most beautiful things I ever

beheld. The clusters of graceful date palms seen in outline against a sky of ever-changing tints, and the dark, mysterious foreground of water with its distorted reflections made a picture which held us spellbound as long as the brief tropical twilight lasted.

Our only messmates were our friend Sergeant What's his Name and an Egyptian Binbashi, Shafeek Effendi, an officer in the Anglo-Egyptian army. . . . One of the Sergeant's army songs [I had not at that time heard the original] I thought worth jotting down:

"In that little town called London,  
"Many miles across the sea,  
"I have a true love waiting,  
"A-waiting there for me.  
"But send me south of Sarras  
"Where the medal-roll begins,  
"Where there ain't no wine or women  
"And a man forgets his sins.

*Chorus*

"On the road to Dongola(y)  
"Where the ancient railway lay  
"And we toiled and broiled and sweated  
"To make a mile a day.  
"On the road to Dongolay  
"Where the dying camels lay  
"And the sun it shone like hell-fire  
"And grew hotter every day."

Every evening near sunset, some of the Arab boys came out upon the roof of the barge alongside us and went through the strange system of calisthenics which constitute the prayers of all good Musselmen.

And so the time passed. We arrived at Wady Halfa or a point very near it on the night of July 6 and next morning set foot on Sudan soil (for how long?)

*Atbara, July 10.*—The preceding was written during our journey by rail across the Nubian Desert. . . . On

arriving at Wady Halfa, we were met by the Commandant, Anley Bey, and by Macaulay Bey, superintendent of the Soudan Military Railway, who invited us to breakfast and showed us every courtesy. The desert ride, although monotonous, was interesting. An absolute desert it was in the fullest sense of the word, much drier and more barren than the Sahara, one of the officers here tells me. It is a fine place in which to study the mirage, which meets the gaze on every hand. Little blue pools lie in every direction, appearing at times not more than a few hundred yards distant. Frequently the railway track ahead seems to be flooded, the water disappearing, of course, as one approaches it. Hills in the distance become islands and occasionally seem lifted above the horizon line altogether, appearing then as if suspended in the air. In all these cases the objects in question are seen to be double, the lower half being the inverted reflection of the upper.

Our journey was delayed by two mishaps. While in the very middle of the desert, a freight car caught fire and as there were several hundred gallons of oil among the cargo, the flames were soon beyond control. The car was of course quickly uncoupled and left to burn by itself while a poor Greek, one of the owners of the cargo, looked on and wept. The car contained general merchandise with which a number of Greeks were intending to start a store and as the goods were not insured, they lost everything. A lucky thing it was for us that our belongings had not been stored in that car. It would have ended our expedition. All our efforts to overturn the wreck were futile and we had to wait for a wrecking train which came at midnight. Binbashi Shafeek, whose knowledge of English is not very extensive, made a written report of the casualty which was rather amusing. Among other things he stated that, in his opinion, the fire was "caused by compustion."

The next cause of delay was a "hot-box" in one of the engine-trucks, which kept delaying us at intervals and finally led to our spending the night at Abadia. Thus the journey from Halfa, which should not have taken more than 18 hours, lasted two days.

We each had the pleasure of riding in the engine for a distance while crossing the desert, being invited by engineer Rolf. Rolf is one of the aristocrats among the engine drivers of the S. M. R. That is to say, he runs one of the American engines, made by the Baldwin Co. It really stirred our national pride to hear the people here talk of our locomotives. The four in use here are always mentioned as "the American engines" to distinguish them from the far inferior ones of Glasgow and Leeds manufacture first used on the road. I saw on the wall in the engineers' quarters at Station 6, a quaint memento (a camel's shoulderblade, I believe) bearing the inscription: "In loving remembrance of Sammy Annet, who through perseverance has been promoted to an American engine . . ." etc. I cannot remember the rest.

*Atbara, July 18.*—This is the tenth day since our arrival at the military station of Atbara at the junction of the Atbara River with the Nile. We have not as yet done very much scientific work, owing to a number of reasons, chief among which is the sickness of my two companions. Only two days after arriving, Hunt complained of feeling unwell; he soon developed a fever and has been confined to his bed ever since. "Simple continuous fever" is what the local medical officer says it is—nothing at all serious but very annoying to Hunt. His temperature has risen to  $103\frac{1}{2}^{\circ}$  several times (104.3 once). Harrington's case is much lighter, although he is shelved for the time being.

But the illness of my companions ought not to have kept me entirely idle and it would not if I had had any means of working at my disposal. Unfortunately, how-

ever, we have not been able more than once or twice to obtain help in using our nets, there being no fishermen in town willing to work for us. The local Commandant, Binbashi Swabey, has made frequent promises to try to secure help for us, but until today nothing definite was done. This morning I stopped to see him in his headquarters in the government building and he summoned the fishermen of the village. They recognized the "Abu Bishir" (*Polypterus*), a stuffed specimen of which I carried with me and seemed quite familiar with it. "Mushir" is the name by which it is known here. According to their story, it does not appear till December and then is found in considerable numbers, sometimes four or five being taken in a day. The fishermen's idea was that it came down from the White Nile, which seems quite possible, though I do not know what reasons they have for thinking so. At the time of appearance, they say, the fish are full of eggs. The men had never seen young, however, smaller than a span in length. I offered them the eight shillings reward we had agreed to give for the first specimen they should bring us and they promised to search for the fish. The Commandant also telegraphed to the acting Mudir of Berber, asking him to send us two fishermen for our own exclusive service. Thus, at last, it seems that we may be able to work. This delay has been intolerable.

However, in spite of obstacles, we have made the beginning of a collection, already having museum specimens of twenty species of fishes. Also, I have been preparing a few brains, including two of the electric catfish. We have seen many hauls of fish and have learned what are the common kinds taken here. And one large fish, probably a *Heterotis*, we found to be full of nearly mature eggs.

Meanwhile, we are getting acclimatized. The process does not seem to hit me as hard as it does the other

members of the party. However, it is too early for me to brag. I am waiting my turn patiently. In the very row in which we are living, there are two other sick people, not to speak of all those in the military hospital near by. Hunt and Harrington are being cared for by the local medical officer, Binbashi Nickerson, who has tended them constantly and shown himself to be a very useful and obliging fellow.

*July 20.*—The fishermen, three in number, came from Berber today, and commenced their term of service for us. We are to pay them four piastres (20 cents) per day apiece, in addition to what fish we do not ourselves want, which will be the greater part of each day's catch. They do not seem to be satisfied with our nets and want to send to Berber for their own, as well as for their boat. They too recognize *Polypterus* and, like the others, say it is common later in the year when the water is low. . . .

Today the thermometer recorded 111°. The highest so far has been about 114°, while 110° is of almost daily occurrence. But the nights are tolerably cool and we sleep comfortably in the open air unless driven in by one of the dust storms so characteristic of this region. Thus far we have only experienced two of the genuine Atbara dust storms, but we learn that this is not the dust season. They come up suddenly and last for hours, sometimes for a whole day, we are told. The dust is the finest possible and there is no keeping it out, for the storms are genuine blizzards in violence. Your face soon looks like a coal-heaver's, your eyes become irritated and your mouth fills with grit. As for your belongings, they are snowed in under real drifts of this delightful substance. To keep even tolerably neat and clean is out of question in this part of the world, all the more so as the houses are of mud, with neither floors nor real doors and windows. The apertures which serve as doors and windows are covered with palm-leaf matting to keep out the worst

of the dust and this same matting is used for thatching the roofs. Our quarters were placed at our disposal by the Commandant, and they are presumably as good as the country affords. They served as quarters for some of the officers during the Atbara campaign of last year and are locally known as "Harmony Row," though we have not yet learned the real origin of this name. We occupy eight of the single-room compartments of this row. This is more than we really need but they were lying vacant and we took them. On the west side is a covered passage-way, which might be called a verandah, extending the whole length of the building. It is here that we bring our angarebs (Egyptian beds) at night and sleep. Which is just what I propose to do now.

*July 22.*—Hunt is nearly well but Harrington is distinctly worse. His temperature rose to 103° today and his bowel complaint continues. The doctor has let drop threats about "invaliding him out of the Sudan" if he doesn't pick up soon, but these were only half serious. There were two other sick people in our row until a day or two ago when they were sent down to Wady Halfa to the hospital. One of these latter, a Frenchman, was a next-door neighbor of ours. He used to moan a good deal at night, which the doctor, a thorough Britisher, laid to his Frenchman's want of pluck. An amusing instance of Anglo-Saxon conceit was furnished one day when Captain Swabey brought in the acting Governor of Berber to see us. We regaled them with soda water made in our simple generator which happens to be of Swiss manufacture. The Governor's only comment on seeing the latter was: "Very nice things to have, but why don't you get the right kind, made in England?"

The English officers we have met all agree in their absolute contempt for the native races. The doctor is a mild-spoken enough fellow at most times but he never speaks of the natives except in terms of utmost scorn.

"The Egyptian is a fool, the Berberine a rogue, the Jaalin a Jew and the Sudani a damned ass" is his terse estimate of the inhabitants of this region. He has more than once told us that in case any of our servants got unruly, we should send them over to the Commandant to be flogged, and I have myself seen him administer a vigorous kicking to a black who persisted in standing around when he wasn't wanted. Such harshness seems fully justifiable if one may believe the stories told of the mendacity and moral depravity of the native population. Machmoud, the Dervish general, was asked, after his capture, why he had massacred the Jaalin tribe. "You will understand why, after you have ruled them yourselves for a while" was his reply.

By the way, Dr. Nickerson says he has seen Machmoud a number of times at Wady Halfa, where he is now in prison. He can be distinguished from a distance by his haughty bearing, still every inch a chieftain in spite of his misfortunes.

It is hard to realize that the region we are now living in was, but a year and a half ago, ravaged by Dervish raiders. Yet it was in April of last year that the Battle of the Atbara was fought and the province of Berber freed from the fear of the Khalifa's hordes. Now the Pax Britannica has settled upon the land and one might wander alone for a hundred miles in any direction without the slightest risk. Harrington and I did not feel the least uneasiness in sleeping on the open ground by the river bank some miles east of the village. This condition of peace is not appreciated by everyone. The Commandant repeated to me a conversation he had with one of the Jaalin Arabs, a tribe which, more than any other, had reason to be thankful for peace. "I am told," said the native, "that you English are not going to allow any more slavery here." "Certainly not," said the Englishman, "you can keep what slaves you have now, but

no more are to be bought or sold." "But when ours all die, what are we to do then?" "Work," replied the Commandant. "What, a Jaalin work!" exclaimed the Arab in consternation.

In general, our life here does not conform in the least to one's traditional notions of the life led by African travelers. We have had no thrilling encounters with wild beasts, no midnight attacks of hostile natives, no deadly serpents striking at us in the grass. In fact we haven't experienced anything that could by any flight of imagination be exaggerated into a "hairsbreadth escape" in a letter home. Aside from my friends' illness, we have been having a pretty easy time of it, living in truth like real swells, with three native servants and dinners such as no one need be ashamed of. Our "boys," Hassan, Achmed and Weled ("weled" = Arabic for boy) probably do not together do much more work than the average American maid-of-all-work and they seem inclined to grumble at that. Harrington prefers to converse with them in Arabic, although Hassan talks English fairly well. Our comrade's fluent discourses seem to be made up of various combinations and permutations of about ten Arabic words, and must furnish a never-ending source of amusement to the servants.

*August 2.*—Serious things have happened since I last made notes in this diary. Chief of all is Harrington's death, which occurred on the afternoon of July 26th. Although he had been quite ill and had had high temperature ( $104.2^{\circ}$ —at one time  $105^{\circ}$ ) we did not feel at all alarmed for his safety until the morning of the 25th. At that time, although his fever had considerably subsided, his pulse was very weak and his mind began to wander. Dr. Nickerson planned to send him to Wady Halfa on the following day, if he should be well enough to endure the journey. Harrington got wind of this and was very much disturbed. Lord Cromer would surely

hear of it and that would be the end of the expedition—the expedition that he had been working so hard for during the last six months. And the idea took various shapes in his disordered mind and worried him all through the day. To be “invalided out of the Sudan” became a nightmare to him. Towards evening he got onto another tack. He imagined himself set to perform physiological experiments by Hunt, whom he fancied to be studying his respiration. And he would lie back and puff and thrash his feet about and talk the wildest nonsense about “white blood corpuscles running against crystals” and “perspiration flowing into the tympanum” and the like—a genuine “professional” delirium.

Nickerson, Hunt and I watched in turn through the night, keeping him quiet and forcing him to take liquid nourishment. It was a decidedly gruesome night with all his delirious raving and his constant attempts to get up and walk. At one time he had a violent spell, and this happened again in the morning, when he became abusive and cursed us all vigorously for a while. Then came a comparatively lucid interval and he apologized for anything he might have said in delirium. That was the last time he was truly conscious. He sank rapidly all through the morning, his limbs becoming hideously cold and cadaverous and literally flowing with perspiration. During this period, he muttered a great deal: “Cold! Cold! very cold!—impossible!—impossible to believe! Sudan cold!—impossible! impossible! . . .” continuing in this strain for a long time. [See page 113.]

Nickerson and Hunt applied the usual stimulants, but without success. On Nickerson’s suggestion, I brought an electric catfish which we happened to have alive. The violent shock convulsed Harrington’s arm, but beyond that had no result. The end came at two P. M.

Harrington’s illness dated back to a trip which he and I took together only two days after we came here.

We rode with Swabey along the Atbara River for a few miles and having set a trawl, we decided to spend the night on the spot, Swabey, of course, returning home. During the evening we were forced to drink considerable quantities of the muddy river water. We took other liberties with our digestive organs, such as eating, between us, a whole can of tinned pineapples and making a sort of punch out of the syrup, with the addition of whiskey and Atbara water. A turbid and unwholesome looking mess it was. We had a blanket apiece which we spread on the hard bare ground and there we tried to sleep. During the night a dust storm came up and added to our discomfort. In the morning Harrington complained of being rather cold, and he had worn no "cholera-belt," a necessary precaution in this climate. As a result, probably, of this experience, he was taken with diarrhea a day or two later. Although this continued without improvement, he for a long time refused to consider himself unwell and certainly at home such an attack would have given no ground for alarm. But here everything is different. It requires very little to kill a person in this climate, and any trifling complaint deserves immediate attention. Once let your system become in the least disordered and the Sudan does the rest. To aggravate his illness, Harrington insisted upon going to the Commandant's office one day, against the doctor's particular advice to remain quiet. This was on the 20th. After that, he resigned himself to being sick. The rest I have already told.

Our comrade was buried in the little English cemetery just beyond the limits of the town. A detachment of the Eighth Egyptian Battalion bore the coffin to the grave, draped in both Union Jack and Stars and Stripes, and the band led the way playing a funeral march. The British officers of this station and Stanton Bey of Berber

walked to the graveyard and the American bridge crew\* of eight men turned out in a body to show their sympathy with their fellow-countrymen. The Commandant read the English service. We stood there together in the desert as the sun was setting while the Sudan received the body of its latest victim.

The whole afternoon's happenings had passed like a sort of weird dream. I could not convince myself of the reality of it all. Only a few hours ago he had been living and here we were standing at his grave. And but two days ago, we had not fancied his life to be in danger. Whose turn was next?

Whose turn, indeed? We had read a good deal in Steevens' book about the "murderous Sudan" but had thought such language to be probably mere newspaper rhetoric. We have now some figures of our own bearing on the subject. About a week before Harrington's death, there were in "Harmony Row" and the little house next to it six white men. Of these six, I was at that time the only well man. Two of the patients had to be sent to Wady Halfa to the hospital, where one, the Frenchman, died. Of our party of three, one died, while another was confined to his bed for about ten days. And lastly, our neighbor, Captain Flint of the Transport Department, was suffering seriously from malaria. To be sure, his complaint was contracted on the Blue Nile, but none the less in the Sudan. The name "Harmony Row" seems like a ghastly piece of irony after such a record. Just what all these cases are is uncertain. Nickerson spoke of Hunt's case as "sun fever" and at first he thought Harrington's case to be of the same nature. Later he thought that Harrington showed decided symptoms of typhoid. His official diagnosis was "simple continued fever with typhoid symptoms." Hunt thinks that typhoid

\* The contract for the construction of the new Atbara bridge had been awarded to an American firm.

was almost out of question in Harrington's case. The Frenchman's death at Halfa was reported as due to typhoid, but Nickerson said that he showed no more of such symptoms than Harrington.

The "murderous Sudan" is not entirely a fiction then. Nickerson says, with I don't know how much wisdom, that the West Coast itself is not much worse. But everyone does not speak so ill of the country. Stanton does not think the climate dangerous for a person of sound constitution, and here we see the American crew of eight men who have not yet had a serious case of sickness. One must learn to adapt himself to the country—"learn to respect the old Sudan," as Hunt says.

*August 4.*—Last night we were entertained with an especially violent dust storm. It came on with a rush, luckily before we had got to bed. We had prepared to sleep outside as usual and of course had to beat a hasty retreat with our angarebs. This has happened frequently of late, perhaps three or four times during the past week. But last night's storm was a record breaker. I took to Hunt's room, his being the only one in the row provided with wooden doors and windows. In spite of these protections, the atmosphere of the room was as if a dozen men were shut up there, smoking cigars, or better, as if a very dusty carpet were being beaten. This infinitesimally fine powder rapidly settled upon everything and our hair turned gray in the course of a few minutes. Fortunately a light shower fell at the end of an hour or so and did a good deal toward clearing the air.

But the dust storms are not the only unpleasant features of Atbara life. Our rooms are infested with scorpions. We only need to lift up our matting or move one of our boxes to find them. At night they come out of their retreats and sometimes run about in full view. One of these which I caught in my room was over four inches long. I seized him with a pair of long forceps and

the vicious way in which he struck at these with his venomous tail made my flesh creep. There are delightful possibilities to be thought of in this line. We found one of these vermin clinging to a waistcoat of Harrington's which was hanging against the wall and had to shake the article vigorously before the creature would loosen his hold. Stanton Bey tells us that he was stung twice within a fortnight last year by scorpions which had got into his clothes—or, worse yet, one of them got into his bed. Hunt and I have become almost morbidly cautious on the subject and carefully "shake the scorpions out of" every garment before putting it on.

However, scorpions are not really dangerous animals, a statement which cannot be made of another class of creatures that infest one's dwellings here. Our neighbor, Captain Flint, brought us one afternoon a venomous snake which he had just killed in his house, the third to be found there within the past two months. Today we captured a small specimen of the same species in our mess-room.

Hunt and I expect to go out with the fishermen at three o'clock tomorrow morning.—At the moment of writing this, an enormous spider (called by Arabs "Abu Shepad") five inches long, entered the room where I sat, and when I sprang up with the candle to try to capture him, he made straight for me and followed me around the room several times. Thinking that it was the light he was after, I set the candle on the floor and stepped a little distance off. But no, he wanted me and nothing else, and kept me dodging around the table for some little time before I was able to get off my coat and whack him with it. Now he reposes peacefully in a jar of formalin and I am going to bed.\*

*August 6.*—Last night it was not a dust storm that afflicted us but a rain, the first real hard shower we have

\* This creature was one of the Solpugida.

experienced here. We had been warned that the Atbara houses were not built with view to keeping out rain and we soon found this out for ourselves. Great streams of liquid mud poured in from a dozen points in the roof at once, drenching our beds and clothing and forming small ponds on the floor. I had betaken myself to Hunt's room and we were laughing heartily at this latest exhibition of the Sudan's possibilities when the cook came running in very excitedly and told us in pantomime that Hassan had been stung by a scorpion. We hurried to the boys' quarters and found the poor fellow seated on his bed with his ankle bandaged and evidently in a good deal of pain. Achmed had his razor ready and was prepared to bleed him. Hassan had been stung in the foot, having trodden upon one of the horrible creatures in the dark. Hunt did all he could for him, which consisted in rubbing on ammonia and giving him a morphine pill. Although evidently suffering greatly, Hassan refused whiskey, probably on account of religious scruples, spirits being forbidden by Mohammedan law. It was quite exciting for a while in that room. The wind was blowing a gale and drove the rain through the open doors and windows in torrents. We were drenched to the skin in a moment and our pell-mell flight along the verandah to our own rooms did not tend to dry us much.

Hassan had shown great composure throughout and was up bright and early in the morning as if nothing had happened.

This evening, just before beginning to write these notes, we caught two of the vermin in the room where we were sitting. One of them, a huge fellow four inches long, came running across the floor towards us when we rudely ended his career of crime by clapping him into a jar of formalin. We have a very long pair of forceps which we call the "scorpion forceps" from the chief use we now make of it.

Last night's wind blew over some of the telegraph poles, so that the wires are down in front of our row.

*August 9.*—Yesterday morning Hunt and I went with Nickerson to see his hospital. Like all the other buildings in the village, the hospital is mud-built, but it is quite capacious, holding at present 160 patients. Nickerson is head physician, his assistants being Syrians, graduates from the American school at Beyrout. As we entered each ward, an orderly at the door gave some order in a loud voice as a signal for the patients to be in proper position, and on passing in we found them sitting up and looking their best. All of them were natives: Egyptians, Sudanese and Arabs. In only one ward were there angarebs, the patients elsewhere having to lie on the ground. Malaria, anaemia, dysentery and syphilis were among the diseases best represented, cases of the last named malady being especially numerous and virulent, and having one ward almost wholly devoted to them. Of all the loathsome and revolting sights I ever beheld, none could compare with what we saw in this ward. And here is a young man of sensibility and refinement who expects to spend several of the best years of his life treating such cases as these.

But I seem to be dwelling on the sombre side of Sudan life. There is another side. In fact we have been enduring life here pretty well. Even the discomforts are still novel enough to be interesting and there is now and then a bit of positive enjoyment to be had. The glimpse we get into the life of the British officers is full of interest. We have been thrown together with them more or less in a social way. Twice we have gone over to their place to dinner and a few days ago we decided to repay the hospitality. Without bragging, I think we may claim to have "gone them one better" as far as the dinner went. That dinner was the result of a deal of careful thinking and planning and consulting with our boys. And the

boys did themselves proud indeed. Swabey was evidently incredulous as to our ability to play the part of hosts for he sent over a note early in the evening, kindly offering us the use of his servants, chairs, tables or plates, or anything else we happened to need. We accepted the chairs but loftily declined any further assistance. Our table, it is true, had perplexed us a good deal. A glance beneath the cloth would have revealed to our guests the desperate straits we were in as regards furniture. It also would have given them some further evidences of "Yankee ingenuity." But when the dinner came on, the surprise must have deepened into awe. Achmed had made the supreme effort of his life and that is saying a very great deal, for Achmed is really a master of his profession. The climax was reached when the champagne appeared. Our guests expostulated. Champagne was really not a Sudan drink at all. They kept a little of it at the house but they didn't think it went with the climate, etc., etc. They seemed to think some such excuses necessary.

The three officers of the post, Swabey, Nickerson and Micklem, are a trio of about as different men as could be. Of the three, we have seen the least of Micklem. He is an engineer and is here to superintend the building of the bridge. He seems to be a man of few words and when he has talked it has been chiefly about the state of the Nile flood or other local conditions. We only learned by accident that he was a D.S.O. Swabey, the Commandant, is also rather a reserved man. Although he has shown us every courtesy and responded liberally to any call upon his services, he does not give me the impression of taking any real personal interest in us or our work, which is perhaps natural enough. With Nickerson the case is quite different. He drops in frequently to chat with us, and during Harrington's illness he worked over him with real devotion. He is a sandy-haired, blue-eyed young fellow, who always speaks in a

quiet sort of monotone that gives one at first the impression of coldness. He throws a good deal of dry humor into his talk, chiefly in the way of satirical comments upon the country and its people. With all his real warmth of heart, he has absolutely no charity towards the native inhabitants. He sat down the other morning and kept us for a long time convulsed with laughter over his strictures upon the poor natives.

These English certainly lord it over the inferior races. While Hunt went out on a shooting trip with Nickerson yesterday, the latter gave an Arab a severe scolding for not rising and saluting him as he passed. He said he should have kicked him but for his age. When Hunt and I pass the native sentries on our way to the village, they generally bring their guns to an "order" by way of salute, civilians though we be. They have had this attitude of servility thoroughly thrashed into them. And I imagine that no one who has visited this country would very much condemn this way of dealing with them.

*August 11.*—Yesterday, we gave our Arab fishermen a dishonorable discharge. We had long suspected that they had not been dealing squarely by us. Hassan claimed to have seen them carrying fish to the market to sell without first showing them to us, and it was quite significant that they had brought us few of marketable size. He had let these misdoings pass unnoticed at first, because the fish which we then wanted were of kinds which the men could not sell if they wished to. On Wednesday morning, one member of this gang of thieves, having evidently had a falling out with his comrades, came in from the fishing ground ahead of them and "peached." They had caught a fine large fish that morning which the others had insisted upon selling. Of course, he himself had tried to induce them to bring it to us. This was all the evidence we needed and we resolved to rid ourselves of the men, especially as we had little fur-

ther use for their services. To the informant we paid his full wages, the others were given only half the amount owing them. We told them that if they wanted anything more, they could go over to the Commandant and he would give them a flogging. They appeared fully satisfied and they had good reason to be, for we had dealt with them much more liberally than the Englishmen would have done. Nickerson advised us to pay them nothing at all, assuring them piously that God would reward them. As good Mohammedans, they could not deny the force of such an argument.

I have for a long time made no note of our work or plans. Since Harrington's death we have been working pretty diligently, the latter word of course being used in a sense quite relative to the climate. We have got a fairly complete set of the local species of fish and have put up a good deal of neurological and other material. But as to *Polypterus*, the real object of the present expedition, we have reached only negative results. With the exception of a single specimen which Shafeek sent us from Omdurman, we have not met with the fish at all. But we are told by many different fishermen that the "Mushir" is quite common here at time of low water. Also we have it from probably reliable sources that the fish is abundant in the White Nile above Khartum. Acting on the latter information, we applied for permission to go to Khartum. Our request was promptly refused by Colonel Maxwell who is Acting Governor General in the absence of the Sirdar [Kitchener]. Maxwell himself we had the honor of meeting yesterday as he passed through Atbara on his way to Wady Halfa. This gentleman commanded a brigade at Omdurman last year and in Kitchener's absence he is the "biggest" man in the Sudan. He was very polite and explained that he had regretted greatly the necessity of refusing our request but saw no way of making an exception in our favor,

similar applications being refused every day. Lord Cromer, too, had told Harrington that we could not get to Khartum till the railway was completed.

*August 12.*—Now as to our plans. One thing is sure in our minds. Neither of us intends to sit down here at Atbara and wait for the winter to come. We certainly could not spend the time profitably either for ourselves or the expedition. And then again, we cannot quite dismiss all thought of our own health. Nickerson let drop the remark to Hunt yesterday that unless our work prevented, we had better be pulling out of the country as soon as possible, that Sumner was "getting a damn bad color," while he (Hunt) "had lost at least a stone in weight." However, we should be willing to let color and weight take care of themselves for a while if we saw any prospect of doing what we came out here for.

Our plans then are these. We are preparing to leave Atbara immediately. From here we shall return to Cairo, stopping a week at Berber, and also pausing to see a few of the temples on our way down the river. After that we shall spend a few days in the Delta, looking into some matters ichthyological and then sail for Naples. Hunt, who only enlisted till October, will go back to "the States" at once, while I shall spend a few months in work at the Stazione and then return to the Sudan. By that time the railway will probably be completed to Khartoum, if not, I can try again at Atbara or Berber, where, according to report, I ought to get my fish during the winter months. As far as our own feelings go, we are quite ready to leave by this time. Last night, we had another steady rain which soaked our blankets and kept us miserable. I lighted my candle and endeavored to keep awake till the rain let up, as I was afraid to sleep in such a drenched condition. But I did fall asleep at last from sheer exhaustion and when I woke again the candle had burned out and daylight was beginning to ap-

pear. One cannot go on indefinitely having his night's rest broken up in this fashion without feeling the effects of it.

But there are a few compensating features in our life here. This afternoon, as Hunt and I were out with our camera, Nickerson and Miklem happened by and asked us to take a ride with them across the Nile on the "Safieh." This is an old Dervish steamer, with quite a history, which serves at present for ferrying and other purposes connected with the building of the bridge. She dates back to Gordon's time, being a "penny steamer" [ferry] brought by him from the Thames. It was the "Safieh" which carried Lord Charles Beresford when he rescued Wilson on his way from Khartoum, after the tragedy of January, 1885. She still bears on her boiler the patch put on by Lord Charles to repair a shot-hole received on that occasion, at a time when the position of those on board seemed desperate. Her armoring, too, has been riddled by bullets during many skirmishes. After something like thirteen years in the possession of the Dervishes, she again fell into English hands, being captured by the Sirdar's forces during the Fashoda expedition. Before Kitchener's arrival, Marchand's guns had repulsed her and left their marks on the scarred and battered old craft. The same "reis" or captain has had charge of her through all her changes of ownership. He is a tall, dignified old man of the Jaalin tribe who knows no English whatever except the commands used in running the boat. These he learned during the old days and has continued to use through all his years of service under the Dervishes. It sounds rather strangely to hear the orders "Half speed," "Easy," "Stand by" and "Stop" come from the lips of this dark-skinned old patriarch and addressed to a crew of Arabs and Sudanese.

We took some photographs of the "Safieh" and the old reis, or at least attempted to do so. What success we are having with our efforts at photography we shall not

know till we reach Cairo. [Very little success, as it turned out.] Harrington had charge of that branch of the expedition's work and neither Hunt nor I know anything of the art. We are shooting at random and ought to have a few good pictures by mere chance as our supply of plates and films is abundant.

*August 14.*—Yesterday evening Micklem brought over a mongoose which had been caught in the morning near the bridge, but had declined to live in captivity, preferring death to servitude. It had a fine pelt which I prepared for future mounting, the job lasting till 1:30 A. M.

*S. S. Oruba (Orient Line), Sept. 23, 1899.*—Tomorrow morning I go ashore at Naples. Yesterday Hunt and I parted company at Marseilles. He is going to Gibraltar to wait for the next N.D.L. boat for New York, expecting to pass the week's interval in seeing something of Spain. I am intending to work for an uncertain period at the Zoological Station. Our search for *Polypterus* has been finally abandoned and we two, the survivors of the ill-fated "Senff Zoological Expedition," return with little to show for the expenditure of such a large part of the fund which sent us out (to say nothing of the life of one of our party). After hearing of our rival's success in Western Africa, we prepared to leave Egypt forever and telegraphed to Colonel Jackson to forward the boxes we had left stored at Berber. But this is anticipating. I must first record some of the happenings of the last six weeks.

We had left Atbara on the 19th of August. Before returning to Cairo, we had intended to spend a week or so at Berber, accommodation having been promised us by Col. Jackson, the Mudir of the Province. But our stop there was brief and our departure sudden.

Berber is about an hour's ride from Atbara. On account of an unexpected delay (which is the thing one learns most to expect in the Sudan) we did not reach Berber till about nine P. M. Col. Jackson sent horses to

meet us at the station. They were both cavalry horses and both had been wounded at Omdurman, with Jackson in the saddle. My mount had been through Tokar as well. At Omdurman he received a wound in the head that blocked in some way the nasal passages, so that the animal wheezed very audibly. On our arrival at the Governor's quarters, Jackson, of course, made us dine with him, although he had finished dinner himself, having given up waiting for us. He was cordial to a degree, asking us be his guests as regards meals, during the whole of our visit, and putting at our disposal the house which General Hunter had occupied the year before. Although mud-built like all Sudan houses, it was a real palace compared with "Harmony Row." We found our host a most entertaining man. Although still a young man, he had been in the country ever since Tel-el-Kebir (1882). It was he who was left in charge of Fashoda at the time of Marchand's stay there. Of Marchand, himself, Jackson spoke highly. In fact the explorer seemed to have made a favorable impression on all the Englishmen he came into contact with. This speaks wonders for him, considering the strength of the anti-French sentiment among the British army officers. Jackson remained in Fashoda for several months and came back with his health badly shattered from malaria. Fashoda must be a delightful place. Out of the Egyptian garrison of about three hundred there, only thirty-seven were fit for duty by March. (I think I have given correctly the figures as stated in Sir William Garstin's report.)

But as I have said, our stay in Berber was brief. For some days past I had been rather unwell and the day after our arrival at Berber, I was really ill. Hunt took my temperature with our only available thermometer which gave me credit for 104 degrees. (We learned later that this was just one degree too high. Hunt had given the clinical thermometer to Nickerson a few days

before, remarking: "I hope we shall not need that again.") As this was our first intimation that I had any fever at all, it was somewhat startling to both of us. Hunt packed furiously all the afternoon and Jackson telegraphed immediately to Atbara regarding trains. We must get out of Berber as quickly as possible, for Berber is no place to be sick in. And get out we did at two o'clock that night. At eleven, we were sleeping soundly, when Jackson appeared with a telegram and told us that a train was probably even then waiting for us at the station. We had gone to bed on the assurance that we could not leave until the following noon. The station was nearly a mile away and there was nobody at hand to carry our baggage. But the Mudir had a happy thought. He ordered out a gang of native prisoners, under armed guard—some twenty-five men in all—to act as porters. All these preparations took time and in the meantime the train must wait for us. But "mâ'alêsh"—let the train wait. That is what they seem to be for in the Sudan.

Our exeunt from Berber was theatrical in the extreme. It was a bright moonlight night with just enough haze to make distant objects look dim and shadowy. Our march to the station led us through about half a mile of open desert. Four of the prison gang carried me aloft in my angareb at the rear of the procession, so that I could overlook the whole scene. On one side rode Hunt upon a white Egyptian donkey, on the other was Nickerson, mounted upon one of Jackson's cavalry chargers, while to the front stretched the long file of rascals carrying our luggage, each liable to be fired upon in case he made an attempt to escape. I called for the band, but the band failed to respond. I had in mind a funeral march. I could not help thinking of another procession in which I had marched but a few weeks before. Nickerson had come in response to Jackson's telegram and his insistence upon seeing me down to Wady Halfa made

matters look rather serious. However, he changed his mind the next day and took leave of us at Abu Hamid.

Traveling on the Sudan Military Railway is a somewhat different thing from traveling in a Pullman car at home. Whatever your rank or position, you generally have to put up with a cattle truck, there being very few real passenger coaches on the line. However, unless you mind being beastly hot in the daytime and beastly dusty all the time, you can get along pretty comfortably, that is if you go prepared for the occasion. Indispensable to the journey are an angareb, a cook and a supply of provisions. The extent of one's discomfort depends largely upon the direction one is traveling in. As one of our British friends remarked, there is no sound more musical to the ears of a person who has lived for a while in the Sudan than the rumble of those old cars as they speed northward, carrying him back to civilization again. The Sudan is a magnificent country to be getting away from.

Before continuing the account of our journey, I will make a few retrospective notes regarding Atbara and what we did there. To the average American, if the word Atbara suggests anything at all it is the new railway bridge. When we arrived at the place on the 9th of July, the first span was being put up. The seventh and last span was completed the day before we left. The piers had all been finished before our arrival. The construction of these—and they form no inconsiderable part of the structure as a whole—was done by an Italian company, only their caps being done by the American firm. The total length of the bridge is 1,200 feet. . . . One of the American mechanics told us that the bridge was built on the "lattice, link-and-pin, through-span" type, all of which is very intelligible to a layman. The work was certainly done in a hurry, sometimes being kept up at night by the light of arc lamps. The greater part of the manual labor was done by natives, of whom there

were several hundred employed, some of them being soldiers, some of them convicts. The bridge was formally opened by the Sirdar, only a few days after we left Atbara.

The country we lived in, although barren enough, was nothing like as desolate as that part of the Nile Valley between Assouan and Wady Halfa. At Atbara there really was a rainy season, though a very brief one, with the showers mainly very light. The vegetation was not confined to the river's edge, but patches of the scrubby "halfa" grass and mimosa bushes were scattered over the desert itself and I am told that such vegetation is met with at intervals all the way to Suakin. Along the rivers, both the Nile and the Atbara, are groves of the date and the "dôm" palm trees. The latter is not to be seen in lower Egypt. It differs from the date palm in usually having a branched stem and the leaves are much like those from which the palm-leaf fans are made. The natives gnaw the rind of the dôm nut which must be nine-tenths cellulose. . . .

As in Egypt, irrigation is necessary to the raising of any crops and this is done by means of "sakiyehs" or water wheels which work somewhat on the principle of chain pumps and are usually turned by oxen. The mournful groaning and creaking of these wheels is a familiar night sound throughout the Nile Valley. But the water wheels are quite scarce in the immediate neighborhood of Atbara. The country was far more populous and cultivation more extensive before the days of Dervish rule.

One of the pleasantest episodes of our whole stay in the Sudan was our visit to Stanton Bey at Berber. This was some three weeks before the visit I have described above. On the occasion of our second trip to Berber, Stanton was away on leave of absence. Stanton was one of the subgovernors of the province and was acting as governor in Jackson's absence. Hunt's expression "bully fellow" describes Stanton perfectly. He was

a big, powerful, well-built man, full of life and humor. Among other things, he was something of an artist and had illustrated more or less for the London Graphic. He had been most friendly and cordial to us ever since our first meeting with him and twice had invited us to visit him at Berber. He was present at Harrington's funeral. We never learned whether he came up to Atbara especially for this purpose but I am inclined to think that he did.

So we went down to visit Stanton on the evening of July 31. He met us at the station with horses, but what was our dismay when he said to us in a matter of fact sort of way: "Of course you've brought your beds with you?" Upon our replying that we had not, he explained that unfortunately he had none to spare. Our unparalleled act of stupidity seemed to weigh on his mind a good deal for he repeated as we approached his house: "Damn sorry about those beds!" Think of a guest bringing his own bed with him! But it seemed to be the custom of the country. However, what he meant was strictly speaking not beds at all but bedding. The "angarebs" are the true bedsteads of the country and we were not expected to bring those. In spite of his talk, however, he managed to furnish us with both.

While at Berber, we picked up quite an assortment of Dervish swords and relics. Such things seem ever so much more valuable when picked up in the Sudan itself than when purchased of dealers in Cairo.

\* \* \* \* \*

*July 29, 1934.*—Thirty-five years have elapsed since the foregoing journal was written. After re-reading it, a postscript seems called for, in order that I may chronicle some bits of subsequent history.

It was our plan at the time of breaking camp that I should go to Naples and return to the Sudan the following winter, pushing on southward to Khartum or beyond, and staying there till the spawning season of the

fish arrived. But a telegram from Wilson, handed us as we reached Assouan from Wady Halfa, put an end to these plans. "Nature reports Budgett's full success." I recall vividly our arrival at Assouan in the early morning, with the rising sun lighting up the graceful little island temple of Philae, shortly to be inundated by the waters of the great new Nile dam.

We construed Wilson's telegram as an order to abandon our quest permanently, and so it was intended. However, it turned out that the report in *Nature* was incorrect. Budgett had not obtained the eggs of *Polypterus*. He did not obtain this prize until 1903, after four successive trips to Africa. Then, at last, he took back his precious material to England, only to die within a few months from the effects of tropical disease. His projected studies were carried on by another competent English zoologist. But the scientific world is still debating the question of the ancestry of the land-living vertebrates!

Hunt and I spent a week or so seeing Upper (southern) Egypt. After about a week (I believe) in the hospital at Wady Halfa, I still had recurrences of fever, and had to take a day off, now and then, resting indoors. It was early September and the sun's heat was still rather fierce. I remember asking Hunt what I had better do. "As a physician," he said, "I can only tell you to give up all thought of sight-seeing." "But it is probably my only chance to see Egypt. If you were in my place, what would you do?" "I should probably take the risk," he replied. And I did.

## CHAPTER IX

### A TEACHER OF ISRAEL

My second stay at Naples, like the first, was not to last long. Dean had been trying to find an opening for me at the College of the City of New York, and late in October I received a cable from him: "Appointed CCNY thousand return immediately." Once more, I was forced to abandon an attractive program at the Zoological Station, as yet hardly commenced. But the idea of having a real job was also attractive to me. All that I had at the time was a Columbia University fellowship. So I sailed for New York.

Up to that time, I had heard little of the College of the City of New York. I was soon to learn much about it. Years before, under another name, it had been the alma mater of numerous men of "old American" stock, some of whom had risen to prominence. President Ira Remsen of Johns Hopkins, General George W. Goethals, Dr. William H. Park, Cleveland Abbe and Bashford Dean, among others, were alumni of the old "Free Academy." But the "C.C.N.Y.," at the time I joined the staff, was a unique and altogether amazing institution. The "old American" element in the student body had dwindled almost to a vanishing point, their place being taken to a considerable extent by Russian and Polish Jews from New York's "Lower East Side." The population of Jews among the students was variously estimated at from sixty to ninety per cent. It probably lay between those limits. The Gentile minority consisted largely of Irish and Italians, with a sprinkling of other races, including a few Negroes. The Anglo-Saxon element was not altogether lacking, but it was overwhelmingly outnumbered. A considerable

number of these boys were uncouth and ill-mannered, and many of them quite plainly came from homes—if an East Side tenement can really be called a home—where bathing facilities were inadequate. Standards of honor in the classroom were, on the whole, deplorably low, and cheating was so prevalent that examinations had to be conducted under the strictest surveillance.

The situation was one which called for sympathetic handling by a group of men of the type that devote their lives to settlement work. However, I think that very few of the faculty had this humanitarian point of view. Most of the department heads were elderly men, who dated back to the “good old days” when the students were mainly “American” boys. Some of them were outspokenly contemptuous of the material which passed through their mill in these later times. For mill it was in a high degree. The courses, to a large extent, were taught mechanically, the educational standards antiquated, and progressive thought conspicuously lacking. The shabby old buildings, with their slit-like Gothic windows, not wide enough to light the rooms properly, seemed quite in keeping with the prevailing intellectual gloom within. The head of the institution, at that time, was an ancient Civil War veteran, a man of good family, who may at one time have had some qualifications as an educationalist, but whose present senility in thought and speech was only too evident.

The “Natural History” department, to which I was assigned, was unbelievably archaic. No one of the staff was qualified to conduct an up-to-date high-school course in any one of the natural history sciences, even as they were then taught in the high schools of New York City. Indeed, there did not appear to be any very high degree of specialization throughout the entire institution. Instructors were transferred from one department to another at times, and some of them seemed to pride them-

selves upon their versatility, which made such transfers possible. One of the staff of our department, having an insufficient number of hours in "natural history" one year, had his time filled out with classes in real history. I always wondered whether the Office regarded this subject as being most nearly related to his regular one.

There were no provisions for laboratory work in our department, and indeed the net periods of fifty minutes each were too brief to allow of such work, even if anyone had been bold enough to suggest it. Department headquarters were restricted almost wholly to one large room, from which several smaller rooms could be partitioned off by sliding doors as occasion required. The whole place was an old curiosity shop, where one was confronted by cases of minerals and stuffed and pickled animals, largely unusable for the purposes of instruction, while trophies of every sort adorned the walls. For a brief period each day, the big room was used as a chapel, and the students swarmed in noisily to hear the reading of brief selections from the Old Testament, the only part of the Bible which could legally be read in the New York public schools. Our department head took his turn conducting these meetings—"doing joss," as he termed it. He usually picked out the passage in the Psalms ending: "Who is this King of Glory? The Lord of Hosts, He is the King of Glory."

The head of our department was a man whom I shall call "Baxter." He has long since been dead, and so far as known he left no descendants. He was a striking looking man, of towering stature, with a big head, decorated with an unruly shock of hair and "walrus" moustaches. Though past sixty, he was powerfully built, and more than usually "virile," in the restricted sense in which that term is so often used. Ignorant of anything but the elements of the sciences, and temperamentally incapable of hard work or close thinking, he appeared

to spend most of the daytime hours, outside of his classroom, in gossip and storytelling. To repeat any of his stories here would hardly be permissible. I think that for most of those who may remember the old "Professor," in the days of long ago, their most characteristic picture of him will show him seated in his little stuffy office, pipe in mouth, with a group of the older students or younger instructors gathered around him, while noisy bursts of appreciative laughter interrupt his narrative from time to time.

Was I one of that group? Yes, sometimes I was. The old man had enough that was genuinely likable about him to win him many friends. He was generous to those whom he liked, and took a genuine interest in some of his students. Moreover, he was strongly entrenched politically, having as his friend a powerful Tammany district leader, who used to visit him from time to time. And so it was not possible to dislodge him, even when a certain amount of housecleaning was undertaken by a later administration of the college. Baxter retained his position until his death from paralysis a year or so after I left the college.

Thus far, I have perhaps over-emphasized the more somber aspects of the old "C.C.N.Y." There were, even then, a number of progressive and thoroughly likable men upon the faculty,\* men who were vastly discontented with existing standards and were holding on in the hope that a better day was soon to dawn. And a better day did dawn, a year or two before I left New York for Woods Hole. But the improvement was not nearly as great as some of us had hoped. A group of new, large buildings was erected, a new president was installed, and some of the deadest of the dead wood on the faculty replaced by men of recognized standing. But

\* It is only fair to add that even in this medieval period of its existence the college graduated a few alumni who attained distinction. I could name one justice of the Supreme Court, and several scientific men of some prominence.

some of the dearest of them likewise remained, including my own chief, Professor Baxter.

Our new president, John H. Finley, was a man of considerable scholarship, a good mixer, who appeared to have more or less acquaintance among literary men. Some of us thought him decidedly lacking in what we should now call "guts," but he doubtless faced enormous difficulties in trying to renovate an institution so largely at the mercy of politicians of both parties. From the fact that he resigned from the presidency long before the age for retirement, I rather suspect that he was not at all satisfied with the conditions under which he labored. He later became one of the editors of the *New York Times*.

My own term of seven years as tutor and instructor in this anomalous institution I cannot look back upon with any considerable satisfaction. I was not by temperament or training qualified to carry on elementary instruction; least of all was I qualified to carry on settlement work with the children of the Ghetto. I lacked the sympathetic understanding of types so alien to all my previous experience; I lacked the patience to deal with uncouth and unruly human material; I lacked the faith that any such efforts were really worth while. Add to this a considerable degree of nervous irritability, which led to not infrequent losses of temper. Finally, I was not endowed with the diplomatic skill to deal successfully with the extraordinary personnel with which I was thrown in the teaching staff of my department. Coming directly from the high standards of Columbia University, I was dismayed and appalled by the medieval darkness of my new environment. I could not conceal my feelings nor avoid invidious comparisons. I succeeded at the outset in forcing through some reforms, chief among which were the adoption of laboratory work in our zoology course, given in two-hour periods, and the acquisition of a small department library. But Professor Baxter

became more and more irritated by my criticisms and innovations. At first Dean (himself a former student of Baxter's) intervened. But the gulf continued to deepen, and relations at last became quite strained.

Throughout almost these entire seven years, I made intermittent efforts to escape from this prison. But the College of the City of New York was at that time no likely steppingstone to a better post in the academic world, and my teaching experience there, even if more successful, would not have helped me greatly in real college work. So I came to devote the minimum necessary time to classroom duties, and as much as I fairly could to biological research. Some of this was conducted at the New York Aquarium, some in the college building itself. In summers I worked at Woods Hole.

At last I took something of a leap in the dark. With only a temporary and low-salaried position in the United States Bureau of Fisheries, I finally resigned from the City College. It seemed at the time a somewhat reckless move, for I now had a wife and child. And indeed we were to experience some years of anxious uncertainty. But my escape was not only from the C.C.N.Y. but from New York City as well. It was well worth the price.

Lest I give offense to any of my Jewish friends, or expose myself to any reasonable accusation of "race prejudice," I wish to put myself on record here with a few remarks on the Jewish question. It is a question concerning which plain speaking is usually avoided, except by persons, on the one hand, who intemperately denounce the entire race, or others who just as intemperately praise it. To begin with, the pretense that the Jews' tribulations, in our country at least, are due to "religious intolerance" is largely a sham. The antagonism against Jews is due almost wholly to their racial characteristics. We may say this without becoming involved in the rather academic question as to whether there is

really such a thing as a "Jewish race." It is sufficient that the Jews do form a racially distinct group within every nation which they inhabit, despite centuries of occasional interbreeding with other elements of the population. The difference between a Smith and a Goldberg commonly goes far deeper than the mere difference in name. Be it gross or subtle, the difference is a biological one, and one which rests on a genetic basis.

When we say "racial characteristics," if we are fair, we mean average racial characteristics. We are not implying the existence of a set of peculiarities which distinguish every member of the Jewish people. It would be folly to deny that certain combinations of traits are more commonly to be met with among certain peoples than among others. And if we assert that certain traits which are repellent to most Americans of European stock are more frequently encountered among Jews than elsewhere, we cannot fairly be accused of defaming the Jewish people. We are merely stating a statistical fact which will, I believe, be generally admitted, at least among those who are not afraid of straight talk. To most persons, including many of the Jews themselves, it would probably seem unnecessary to state that a larger proportion of Jews than Gentiles are unduly acquisitive, that a larger proportion resort to certain unfair methods of achieving their ends, that a larger proportion are offensively self-assertive. Such traits as these, along with certain physical features, mannerisms and tones of voice, make up a "syndrome" which—doubtless unfairly—is regarded by the average Gentile as typical of the Jew.

In my own case, and I presume that of very many others, "race prejudice" amounts to this. If, before learning anything else about a man, I am told that he is a Jew, I have rather less expectation that I shall find him personally likable than if he belonged to one of the "European" races. On the other hand, if I should al-

ready know a man and admire him, I am sure that no subsequent discovery of racial affinity would affect me in the least.

No one, unless blinded by prejudice, can overlook the great contributions of Jews to European and American civilization. These contributions have been made possible, furthermore, by certain great qualities of the Jewish people as such. But I think it is equally fair to say that no one, unless blinded by prejudice, can overlook the existence of certain traits which are offensive to other groups, and which are more frequently met with among Jews than among most other races that we have to do with in our country. To what extent traits of the latter type are genetic (i.e., truly racial), and to what extent they are due to the social *milieu*, can be only a matter for speculation at present. But we should hardly be consistent if we attributed the great achievements of the Jewish people entirely to genetic superiority, while attributing the offensive traits entirely to environment.

Let me repeat that these characterizations of the Jewish people, both favorable and unfavorable, are intended only in a statistical sense. It is no more true that all Jews, or even most Jews, are personally obnoxious than it is true that all Jews, or most Jews, are musical or mathematical geniuses. The Jews whom we all admire and prize as friends are persons of conspicuous modesty, who "lean backward" to avoid any appearance of greed or self-assertiveness.

May I not query in conclusion whether a much more satisfactory basis for accord between Jews and Gentiles might not result from a franker exchange of views on the subject? We usually feel at liberty to discuss racial peculiarities—real or alleged—with a Frenchman, Swede or Italian, rarely with a Jew. In fact, it is usually regarded as bad form to refer to his race at all in his presence. The Jews appear to be the most keenly race-

conscious of all the peoples with whom we have to deal, and this takes the form of exaggerated sensitiveness to criticism. To us Gentiles, in fact, they give the impression of suffering from a racial inferiority complex. Would not a freer exchange of our views and "prejudices" go a long way toward breaking up this complex?

Whether we like it or not, we can hardly deny the existence of an actual "Jewish problem" in some parts of our country. It is too much to expect personal and social prejudices to disappear within the life of anyone now living. But any official recognition of these prejudices, according to the Nazi pattern, could only portend a breakdown of the fundamental structure of our democracy. Is it unreasonable to ask the Jews to consider whether they can expect "race prejudice" to disappear without considerably more self-examination on their part, and a realization that the situation demands extensive readjustments *on both sides*.\*

\* \* \* \* \*

I have made passing reference to my marriage. This occurred some three years before I left New York. The lapse of more than forty years finds me still married, and to the same woman. More curious still is the fact that neither of us has ever contemplated a separation. These are circumstances which may seem to call for explanation. In liberal circles at the present time, the trend, in practice if not in theory, would seem to be distinctly away from permanent marriage. Least of all, would one expect to find such permanence in the case of an extreme individualist who has never been able—indeed who has never tried very hard—to conform his life to

\* A Jewish friend of distinction, who was good enough to read these last few pages, agreed largely with my characterization of the Jews, but dissented strongly from some of my interpretations. To him, the modern Jews form not a racial but a social group, whose peculiarities are of environmental (i. e., non-hereditary) origin. However, the validity of most of my remarks regarding Jewish attributes is not dependent upon the settlement of this question, which I am not qualified to discuss adequately.

the lives of others. It would require an exceptional partner to make anything but failure out of such a situation. The secret of my lasting, and I think I may say successful, marriage is that I have such a partner. It is not my intention to attempt any such analysis of my wife as I have attempted in the case of myself and some others, even for the sake of that all-important consideration, the completeness of the record. For reasons which it should not be necessary to explain, I find it more difficult to discuss her objectively than so to deal with myself. But simple justice requires an acknowledgement of the devoted help which she has rendered me throughout our life together. This has not taken the form of collaboration in my scientific undertakings, but rather of keeping a constant watch over my needs, mental and physical, and sparing my energies in every way. Any ambition which she may have had for self-expression on her own account she has largely submerged for the sake of my undertakings, which may all, to this extent, be regarded as our joint undertakings.

I will complete the family record by stating that we have three children, one son and two daughters. Our son, after finishing college and university training, received a commission in the U. S. Naval Reserve and is now in active service. He is fortunately a much more normal boy in some ways than I ever was. Both of our daughters have finished college, both of them married and both mothers.

For the first three years of our married life—summers aside—we lived in a six-room apartment in what was then a “nice” locality in New York. And this we did on a salary which at first was only fourteen hundred dollars a year. Rents seemed to be high enough, even in those days, but they have vastly increased since then. We settled in a locality conveniently near the new site of the City College which, however, had not yet moved

up town from the old quarters on Twenty-third and Lexington. We were out of the hurly-burly, so far as this may be said of any dwelling place within the limits of New York City; we faced on a broad avenue; our apartment was relatively spacious. Radios had not yet been invented to bark and croon at us from open windows on every side. Far more nearly than the vast majority of New Yorkers did we realize the ideal of living in a real home. The section in which we dwelt had not yet been engulfed by the mighty wave of Negro migration, which has made of "Harlem" the greatest African city in the world, a vast colored metropolis, familiar to the country in recent years through the exploits of Amos and Andy.

One shocking tragedy occurred during the early months of our married life, the death of my sister by suicide. This happened in our little apartment, on the occasion of a Thanksgiving Day visit by her and our mother. I was awakened in the middle of the night by the smell of gas, and found my sister in the next room, dead beyond all chance of resuscitation. It was her third attempt to end her life within the space of a few years. I have already discussed my sister's morbid personality. She sought escape from an intolerable condition of mind and body, and barring the shocking circumstances in which this was accomplished, her passing would doubtless have been a source of much relief to us all.

It is surely a deplorable state of public opinion which looks upon self-annihilation, whatever the circumstances, as an abnormal act, even as a crime. For our daily press, indeed, a suicide is a sensation, the close competitor of a murder or sex scandal as a thing to be exploited and embellished in the interest of the circulation office. Among the most painful recollections of my sister's death is the thought of those buzzards of the press, scenting their carrion as soon as the report had been received at the Health Department, and descending upon

us bright and early in the morning. Now it was a call upon the telephone, now a knock upon the apartment door. And soon the flock began to gather in the hall outside. With no sense of decency, or respect for our feelings, they insistently plied us with personal questions. My own first answers were unrestrained. I told them what I thought of their whole damned outfit. Then our physician, more worldly-wise than I, took charge of the situation, to the advantage of all concerned. But the climax came when the papers themselves, with the "fullee 'count o' the suicide" began to appear on the streets, with all their tawdry Police Gazette garnishing, their hints of purely fictitious romance, and their general disregard of truth or decency. It was the same conscienceless press which doubled the pangs of the Lindberghs a quarter of a century later.

## CHAPTER X

### WHAT I THINK OF NEW YORK

Before passing to the subsequent chapters of my life, lived in widely separate parts of the country, I wish to record some impressions of the city which served as my "home town" for eleven years, both before and after my marriage.

It did not take me long, after my arrival in New York, to accept the New Yorker's appraisal of his city as the center of our nation's life, the place where nearly everything of consequence happened, the place where nearly everyone of consequence lived. All other parts of the country came to appear provincial. Just why these millions of people seem to accept this viewpoint is not easy for an outsider to understand. The great mass of inhabitants are doubtless merely overwhelmed by the city's size, and take a purely quantitative view of its importance. From the higher cultural levels one hears a great deal said about the "advantages" which the dweller in the great city enjoys: museums, libraries, theatres, operas, concerts, lectures, art collections, etc., etc. These are always at the tongue's end of the metropolitan "booster" who tries to rationalize his preference for living in New York. The extent to which these "advantages" are actually enjoyed by the average New Yorker, even by the average educated New Yorker, is to my mind a quite debatable question. My own reaction to the great chaotic metropolis of North America changed gradually from a feeling of awe, admiration and acceptance to one of disgust and revolt. From being the most desirable place in the country in which to live, I have more and more come to recognize it as one of the least desirable.

The teeming multitudes doubtless know nothing better. They take their sordid and unnatural conditions of life for granted. But what shall we say of all those sensitive persons who appreciate the value of tranquility and privacy, of normal life in a real home, of clear skies and unpolluted atmosphere, and landscapes which retain something of their primitive beauty? What "cultural advantages," even if real, can compensate for the blighting living conditions, the submerged individuality, the mad haste for a goal never reached, the ever-present reminders of graft and political corruption in high places, the arrogant, all-powerful minority of those who have acquired great wealth, and the brutalized mobs of unasimilated foreigners who crowd the streets and public conveyances? As a biologist, I can only think, by way of parallel, of the extraordinary capacity of some organisms to become acclimatized to conditions very far indeed from the optimum. Such organisms, if gifted with human powers of rationalization, would doubtless regard their environments as normal ones.

No, dear New York reader—if such a one exists—I am not urging you and all your fellow-townsmen to migrate bodily to California, "where life is better." Heaven forbid! I am not one of those ardent California boosters who, for purely selfish reasons, are inviting the surplus population of all the other states to come to the Pacific Coast. For the sake of increasing land values and other monetary advantages, these malevolent persons are ready to inflict upon us all the manifold horrors of the great cities of the East, and to rob us of those opportunities for the "good life" which we owe, in large degree, to our relatively sparse population. I devoutly hope—for equally selfish reasons, perhaps—that no such large-scale westward migration will ever come to pass. (Alas, since writing these words, the war has brought it to pass!)

It may be noted that I have omitted one grave indictment which is commonly made of the great metropolis, namely its "wickedness." In using this word, the critic usually has in mind sexual and other vices, which are believed, doubtless quite correctly, to flourish in our great cities under the protection of the police.

Whether or not commercialized vice is more prevalent in New York, in proportion to its population, than in most other American cities I have no idea. It is a statistical problem, which could be solved, if at all, only by painstaking investigation. One thing is certain, however, namely that undetected participation in vice of any sort is vastly easier in a great city than in a smaller one. Those who would not, for example, enter a house of prostitution in a smaller city, for fear of being observed by their acquaintances, may do so with little hesitation when safely hidden under the concealing mantle of a limitless population. Thus, in the absence of statistics, it seems altogether probable that a much greater proportion of the male inhabitants of New York patronize resorts of this type than do the inhabitants of smaller cities throughout the country.

## CHAPTER XI

### SUMMERS AT THE MARINE LABORATORIES

Of course "everybody" in New York leaves town for the summer—everybody, that is, except the vast submerged majority who are unable to do so. Happily for me, I belonged to the favored minority. As a student, I had an annual vacation of nearly four months, and this was variously passed at my parents' home in New Jersey, my aunt's summer place in Connecticut, or at one or another of the seaside biological laboratories. One season during my university days was spent at Woods Hole, the forerunner of a long series of summers and a number of continuous years which I passed at that famous scientific center.

Another summer I spent at Cold Spring Harbor, as the holder of a special scholarship established for the occasion by a friend of Bashford Dean's. It was here that I became acquainted with a remarkable woman, Mrs. Charlotte Perkins Stetson, later Mrs. Gilman. I had long been familiar with her satirical poem, "Similar Cases," having first heard it read from the pulpit by a Unitarian clergyman in Minneapolis during my college days. I chanced to engage board and room at a house on the outskirts of the village, and here I found Mrs. Stetson and her young daughter already established.

We three promptly entered into a companionship of a very wholesome and informal sort, so informal in fact that some of the busy local tongues began to wag. However, there was not the least ground for gossip. I knew and admired the brilliant feminist writer as a thinker and student of social problems, and I profited from her friendship during that summer and for a number of

years afterwards. But my admiration for her was never that of man for woman. She was indeed possessed of very little charm of a strictly feminine sort, and such as she had she was not in the least disposed to cultivate or to make use of in influencing others. I should, perhaps, have been just as much attracted at the time by a man possessed of equal vivacity and keenness of mind. But it chanced that I was passing through a period of emotional depression from quite other causes, and this doubtless seemed to lend support to the guesses of "nosey" persons that my interest was of a very different character.

It was largely through Mrs. Stetson that I came to discard two of my earlier prejudices, those respectively against socialists and against feminists. This particular socialist, at least, could discuss her theories dispassionately, without losing her temper or resorting to invective. And this feminist, at least, had a keen sense of humor, and manifested no indiscriminate phobia toward the male sex. Despite her often intense preoccupation with various social problems, and her disposition to seize upon almost any happening or bit of news as a text for some serious discussion, Mrs. Stetson was happily able to abandon herself to spells of the utmost levity. This was fortunate for her own mental balance, and fortunate also for her less active-minded friends, who sometimes found it difficult to keep up her strenuous pace.

One of her favorite pastimes, indeed, was the composition of limericks and other nonsense verses, often by way of a game in which several might participate. On one occasion at the lunch table I threw at her some lines which I had brought into being after prolonged cerebration:

There was a young lady so blind  
As to boast of the feminine mind,  
But when she faced life  
With its trials and strife,  
She was left in the race far behind.

My feminist friend met the challenge with hardly a moment of hesitation:

A young man whose name we can't find  
Laid claim to a masculine mind,  
But to use that great brain  
Caused such turmoil and pain  
That they had to have him confined.

Charlotte Perkins Gilman's death was announced a few years ago, long after the first draft of this narrative was written. Her death was voluntary—sought as a release from the tortures of cancer. An eloquent and altogether unanswerable defense of "the right to die" was prepared by her and published posthumously in the "Forum." Unanswerable, that is, except by the threadbare arguments against "suicide," uttered by those who blink the most imperative facts of human experience, and take refuge in ecclesiastical precepts.

I have already told of my two interrupted visits to the Naples Zoological Station during the summer of 1899. Sometime later in the year, a fairy godfather of mine, shortly to receive attention in these pages, offered to pay the expenses of a visit there during the following summer. And so I made another journey to that wonderful institution and the wonderful region in which it is situated. I spent two months of that year in work upon fish embryology, securing additional material for the thesis which was to be written during the following winter. On this and on my preceding visits, I made the acquaintance of some of that highly interesting group of men who had founded the Stazione Zoologica, and given it its world-wide reputation among biologists. Anton Dohrn, Eisig, Paul Mayer, Lo Bianco—not every beginner in biology was able to say that he knew these men. And there were others of distinction not officially connected with the station: Driesch and Herbst and Boveri

and our own Morgan, and a number of others who have made biological history.

Dohrn took a friendly personal interest in the investigators who made use of his institution, and it was his custom to make the rounds of the laboratory rather frequently. And so he would stroll into my room, ask me about my work, and chat very informally. He even descended to making foolish little jokes. On one occasion, I had some pipefish in one of my laboratory aquaria. As zoologists well know, the male of this fish takes over the eggs, as the female deposits them, and places them in a special brood-pouch on his own ventral surface, where they are kept until the young are hatched and ready to swim. "I tell the ladies that they ought to adopt that system," said the famous biologist with a chuckle. Fortunately most of the leading men of the staff could talk English; otherwise I should have found conversation difficult. Like most Americans, I expected the "foreigner" to speak my language, whether in his own country or in mine.

One morning, I went out early with the station collectors to visit the nets which they made a practice of lowering to the sea-bottom and leaving there over night for the purpose of entangling marine animals of all sorts which might swim or crawl into them. We made the trip in rowboats. All went well with me until our boat was brought to a stop, and the slow process of hauling up the net was commenced. I was speedily overcome. For a period which seemed quite endless, the net was dragged in, a few feet at a time, and the entangled specimens picked off. Meanwhile the boat pitched violently upon the waves of the bay. I lay in that dreadful condition of futile regurgitation, when the stomach has long since ejected its entire contents and doesn't know how to stop. The embryologist Sobotta was in the same boat, and watched me pittingly.

At last I went ashore, scarcely able to walk. It was hours before that horrible nausea left me. But in the evening my appetite returned. I was seated in one of the well-known Neapolitan restaurants, eating a plate of delicious fish. Who should enter but Sobotta! He looked from me to my plate and smiled curiously. "In the morning, you fed the fishes; now they are feeding you," he said in German which even I could understand, adding "Es ist ein Kreislauf."

Toward the close of my working period at the Stazione, I was joined by two of my Columbia friends, J. H. McGregor and O. S. Strong, who were spending part of their vacation in Europe. Before returning home, we spent a few days each in Rome, Florence and Paris. I made a side trip to Venice alone. I am afraid that our sight-seeing was too much that of the traditional American tourist. We could, for example, spend only three days in Rome, and we naturally wished to make the most of our time. We engaged a Cook guide and put our problem squarely up to him. We must "do" Rome in three days. The guide accepted the responsibility, and to do him justice he made good. The rest of our journey was taken in the same hurried fashion, but the results were not, I believe, as bad as might have been expected. We saw many of the most worth-while things, even though the number of new impressions per second exceeded the optimum which would probably be allowed for the best pedagogic effect. In any case, that brief journey represents my only contact with Europe north of the Bay of Naples. But I was destined to see Naples and its environs once more. My experiences in traveling seem to be quite in keeping with the somewhat lopsided character of my cultural development in general.

I have spoken of a "fairy godfather." From my earliest boyhood, I remember hearing my father speak of his old-time friend John Stark (or so I shall call him).

At that time, Mr. Stark was living in St. Louis, but he was one of my father's most frequent correspondents. Later he was to figure prominently in my own life. Stark and my father's family had been warm friends while living in Cambridge many years earlier. My father was ten years older than he, and his young friend appears to have developed a lasting affection for him. I have a few of their letters of that period which scintillate with good-natured banter and extravagant humor of all sorts. I know little of John Stark's early life, save that he was a graduate of Harvard; that he entered the Civil War as a volunteer, with Lieutenant's rank; was soon captured and held in a "Rebel" prison for many months, until he finally made his escape. He was at one time Clerk of Court in the Federal District Court in St. Louis, then an officer and large stockholder in a company manufacturing high-grade bricks for architectural purposes. He never married. During the last thirty-five or forty years of his life, he occupied a bachelor's apartment in a hotel in the conservative "Back Bay" district of Boston. It was there that I used to visit him at intervals during my life in the East.

John Stark was a man of superlative culture. He had traveled widely; he knew a number of languages, including both Spanish and Italian, and read on a scale which made me seem utterly illiterate by comparison. His little hotel apartment was filled with books and paintings. In his quiet way, he was a good deal of a philanthropist. It was only quite casually that I learned of a few of his benefactions, such as sending through the medical school a Negro elevator-boy who aspired to become a physician.

His was a somewhat inscrutable nature. I never really felt that I understood him. His conversations, and especially his letters, abounded in humor of a rare order. (Of this I offer a specimen below.) Indeed, it seemed

at times as if he were incapable of being truly serious about anything. Yet there appeared to be through it all an undercurrent of pessimism and hopelessness in his nature. Despite his many warm friends, he gave the impression at times that his inner life was lonely and cheerless. His extravagant humor was perhaps only a mask, as indeed it seems to have been in the case of Mark Twain.

I am certain that Mr. Stark's interest in me was at first an altogether vicarious one. I was simply the son of his dear old friend of earlier days, and what he did for me was done out of affection for my father. However that may be, this interest took very substantial forms. Gifts, including ten thousand dollars worth of dividend-paying stock, two trips abroad, innumerable visits to his Boston hotel—this is a very incomplete list of the benefactions showered upon me by this fairy godfather of mine. At one time during my student career he asked me to live with him at his hotel, and do my work at Harvard. He had no very near relatives and seemed disposed to adopt me as a son. I knew that no such arrangement could succeed, and I forewent an opportunity such as rarely comes to a youth in limited circumstances. It could not have succeeded, if only because Mr. Stark's attraction toward me rested largely on a misunderstanding of my real character. Above all, he failed to realize that I could not share his own lifelong feelings of affection for my father. Our interests and points of view were so divergent, in fact, that we seldom came into real contact. In the spheres of life which interested him predominantly I was no better than a child, while the world of science in which I was striving to live, represented the one great gap in his erudition. How often did I try to convey to him some idea which seemed to me of vital interest, only to find that he had not been listening to me at all!

Mr. Stark died in his hotel apartment at what is euphemistically called a "ripe old age." To be more precise, he was about eighty-seven years old, he had become very deaf, had lost the sight of one eye, and finally died a lingering and painful death from angina pectoris. For years, he seems to have lived in continual expectation of death, but with none of those delusive consolations which come from a belief in a "Blessed Hereafter." And yet he had done much to help some of his less fortunate fellow-mortals on their way through life.

## CHAPTER XII

### WOODS HOLE

My first visit to Woods Hole was during the summer of 1897, while I was still a graduate student at Columbia University. Those were the days when the Marine Biological Laboratory was housed in a few small wooden buildings, when almost every point on the beach could be reached without "trespassing" on the preserves of some summer resident, and when one could go collecting anywhere in the shabbiest of garments, and return unashamed in his muddy clothes through the streets of the village. It was in that Golden Age of the Woods Hole colony, when the most insignificant beginner in biology came into intimate contact with men whom he had long heard cited as authorities by his professors at college.

My acquaintance with Woods Hole covered a period of fourteen years, during all of which time these pioneer conditions largely held their own. Automobiles were scarce, even in 1911; the yachts of millionaires were seldom seen in the harbor, and a general spirit of simplicity and camaraderie still prevailed. Since then, I am told, the canker of civilization has corrupted the place. I have not been there since 1911, and I have had little desire to do so. What the war conditions of the past few years have added to this despoliation I can only imagine.

After 1897, my next visit to Woods Hole was in 1901, the year of my acquiring the doctor's degree. From that year onward, I was a visitor there every summer up to 1906, when I abandoned my teaching position at the "C.C.N.Y." and moved to Woods Hole for a continuous stay. Thereafter, save for half a year abroad, my

family and I made this our year-round residence for a period of five further years.

During all these years, save for the first summer, my working quarters were at the laboratory of the United States Bureau of Fisheries, now the Fish and Wild Life Service. This everyone still persisted in calling the "Fish Commission." In 1903 a vacancy occurred in the directorship of this laboratory, and I applied for the position. To my genuine surprise, I received the appointment, owing doubtless to the influence of my friend Dr. Hugh M. Smith, then chief of the Division of Scientific Inquiry of the Bureau.

It must not be supposed that the directorship of this laboratory was a very important position. Ordinarily, the incumbent held the office for the three summer months only, and was subject to reappointment from year to year. The salary was only a hundred dollars a month, the highest then allowed for a temporary employee. This appointment nevertheless marked the opening of another definite chapter of my life. As in the case of all the other chapters, I look back upon this one with very mixed feelings. It was a period of considerable freedom of opportunity, lived in surroundings largely congenial—all this during the earlier years of my married life. I enjoyed too the pride of position, at least at first. I not only had charge of the laboratory, but the use of the ample and attractive residence building, and to a certain extent of two steam launches. These last, and at times a larger vessel, the *Fish Hawk*, were at my disposal for scientific collecting trips. My wife and I had the occasional privilege of entertaining visitors of prominence from various parts of the world.

While these things were new, my vanity was considerably flattered. In some quarters at least, I passed as one of the important men of the place. At that time, despite the far greater scientific reputation of our neigh-

bor the Marine Biological Laboratory, the laboratory of the Bureau of Fisheries had a far better basic equipment. We had more and better collecting boats; we had an electric lighting plant, while the other institution still used kerosene lamps; we had an ample pier, inclosing a spacious rock-walled pool; we had a salt-water pumping plant which supplied not only our own laboratory but the "M.B.L." as well. Our scientific workers were quartered in the attractive residence building, while theirs, for the most part, were scattered around the village in meager rented rooms.

However, our laboratory was merely the field station of a Washington bureau, with the customary handicap of political control. My immediate superiors in Washington were splendid men, who held high scientific ideals and sympathized altogether with fundamental investigations of any sort in the field of marine biology. I will only mention two of them, Hugh M. Smith and Barton W. Evermann. There were several others. But final authority in all matters was vested in the Commissioner of Fisheries. The holder of that office in my day was a West Virginia politician, George M. Bowers. Bowers exemplified, in build and in physiognomy, the type made so familiar to us by the newspaper caricatures of his cast. He was a portly person, with full face and dimpled chin, a bull neck, wide expanse of chest and ample abdomen. And his conversation and outlook on life matched his physical appearance. There had been strenuous opposition to his appointment on the part of certain scientific bodies, when the likelihood of this was first announced. But thanks to President McKinley, and later to his successors, Roosevelt and Taft, Bowers held for fourteen years the responsible position which had been created originally for the great naturalist Spencer F. Baird.

Not even the Commissioner's best friends claimed that he knew anything about marine biology, or even

much about fish and the fisheries. It was said in his defense that he knew how to get money from Congress, and that he had sufficient political sense to leave the actual administration of his bureau to experts. There was much truth in these contentions. Congress made appropriations on what seems to have been a fairly adequate scale, and the internal policies of the bureau were probably conducted on the whole in a wise and liberal spirit. But the experts in the bureau were very poorly paid; they were always subject to the handicap of political interference, and were never really free to develop their plans on a far-seeing scale. It is a source of satisfaction for me to recall the almost unfailing support which these men gave me in my small-scale endeavors to make a success of the scientific work at the Woods Hole laboratory. But, as I have indicated, their hands were far from free.

During the summer season I was abundantly supplied with personal assistants—far too abundantly, indeed, for the most efficient results. Political friends had to be taken care of, and so a liberal assortment of their sons and kinsmen were given opportunities each summer to spend a couple of months at the seashore. I would ask for a half dozen assistants to carry on the routine duties of the laboratory. Twelve or fifteen would be sent. Some kind of a job had to be found for every one of these boys, and this was far from easy. The result was that many of them had only nominal duties to perform, a situation which did not make for the best possible morale. In vain did I protest to Washington each year that our establishment was overmanned. Each year the swarm of redundant summer vacationists arrived with their suitcases and smilingly presented their credentials. One year I established a fishing camp on the little detached island of No Mans Land, for the express purpose of finding a parking place for some of these superfluous assistants. But the boys did not relish being marooned,

and the foreman whom I sent to manage them objected strenuously to the type of help which I sent him, which naturally comprised a high percentage of "culls."

When I took charge of the laboratory we had no regular janitor. I was authorized by the higher-ups in Washington to detail one of my assistants for this task. So I picked out the one among them all whom I thought least likely to succeed in any other capacity. The young man grinned and went about his assigned duties as if it were all a rare joke. "He evidently doesn't know who I am," said my new janitor to some of his associates. But a Washington lady who had inside information enlightened me. "Why, don't you know? That boy is the son of B. W., the Washington millionaire." After that, we changed janitors. I had the good fortune at this time to secure the services of a diminutive Portuguese, endowed with the sonorous name of Alphonso de Mello. Alphonso was so illiterate that I had to teach him to sign his own name to the pay roll. But as an employee he was worth a whole squad of political assistants from Washington, though needless to say, his pay was not equal to theirs. He was our loyal servant every summer for a number of years.

The assurance of some of these young men of the political set was magnificent. I remember the fall leave-taking of one of them who had been conspicuously active in the social affairs of the group during the summer, though never taking his duties very seriously. He was the son of a Washington newspaper correspondent, an English Jew, whose services to his country later won him a knighthood. "Hope we shall see you here next summer," he drawled, somewhat patronizingly to Margaret and myself. That he would be back himself went without saying.\*

\* A near relative of this young man married a now internationally famous diplomat.

However, things did not work out so badly as might have been expected in the circumstances. My assistants were by no means all political appointees, and those who were sometimes made good to the extent that I was glad to recommend their reappointment. Many of them were college students, some of them graduates, and there were a few who attained some professional prominence in later life.

My own scientific work during this period was widely diversified, lying in several of the major provinces of biology. This discursiveness was partly the result of circumstances, but it was due even more to the nature of my reaction to scientific problems in general. Though a professional biologist during most of my life, with a considerable measure of achievement to my credit, I have been essentially a dilettante. I have passed from one thing to another, as my interest fluctuated, ordinarily deriving more satisfaction from glimpses of a wide range of phenomena than from a really thoroughgoing analysis of any one of them. This I say, despite my seventeen years preoccupation with *Peromyscus*, of which more anon.

The first topic to hold my attention at Woods Hole was closely related to that covered by my doctor's thesis. It was an attempt to analyze the movements of material by which the early embryonic body of a fish forms itself from the primitive cell-layers that are first differentiated out of the protoplasm of the fertilized egg. This study required the fixation of definite points of reference in the growing embryo, by the insertion of glass needles, or by the actual destruction of early cell-masses, with a view to determining their prospective fate. The fruitful subsistence of experimental embryology had come into existence some years earlier, and had entered upon an active career which is still very far from ended. I made my contribution at this stage—a real, though by no means outstanding one—and then definitely abandoned this field for others which had come to interest me more.

My next venture was the result of a characteristic proneness of mine to tackle "major" problems. Even as an undergraduate student, I had been greatly interested in the debate then raging on Natural Selection *versus* the Inheritance of Acquired Characters as causes of evolution. Why didn't someone settle the matter once for all experimentally? The whole thing seemed so easy. That so few had resorted to experimentation in a field as richly promising as this revealed an amazing lack of initiative. And so I stepped in where angels (as well as many others) had feared to tread, and tackled first the problem of natural selection. Was the mortality of animals on the whole non-selective, as so many were claiming at that time, or were the survivors and non-survivors distinguished by characteristics which could be detected and measured?

Fishes were used in these experiments of mine, chiefly ones belonging to the genus *Fundulus*, a name which has cut a prominent figure in American biological writings now for a half century. As not infrequently happens in scientific researches, my real interest shifted in the course of the program, and became centered on matters which were at first incidental to the original object of inquiry. Respecting the selection problem, I may say that nothing of significance was revealed. No measurable differences of importance between "survivors" and "non-survivors" were found in the course of a considerable number of tests with several lethal agents, and involving many hundreds of measurements. Nearly a quarter century later, at La Jolla, one of our graduate students (Ancel Keys) attacked this same problem with somewhat greater success.

It happens that one of the lethal agents employed by me was fresh water, in its relation to marine fishes, and I soon found myself involved in the purely physiological problem of why salt-water fishes so seldom with-

stand abrupt transfer to fresh water. Before long, I was embarked on a study of the osmotic relations between fishes and their surrounding medium, a study which was not abandoned for another three years.

As a result of these studies, I think that I may fairly claim to have brought to light a considerable body of facts which were both new and of some importance for comparative physiology. Their value was doubtless greatly curtailed by my limited knowledge of physical chemistry and by my indisposition to apply its concepts to the studies in question. My findings were thus left on a purely empirical level, or at most on a level not far below the surface. Such preliminary surveys are of course needed before more intensive studies can be undertaken, but even this sort of preliminary work is more likely to be fruitful when guided by a sufficient understanding of basic principles. My understanding of these, in the present instance, was inadequate.

I must add that my aversion at this time to using the concepts and vocabulary of physical chemistry was due partly to the fact that this aspect of physiology seemed to have recently taken on all the earmarks of a cult among one influential group of workers at Woods Hole. These men talked an unfamiliar dialect, scarcely intelligible to many of those who had previously regarded themselves as biologists. To some of these exponents of the "new physiology," the molecular, atomic and electrical properties of living matter appeared to have altogether supplanted the organism and its visible parts as objects of scientific inquiry, while observed facts seemed at times to be of quite secondary interest to them, useful only when drawn upon to illustrate or confirm some speculation concerning the basic phenomena of life. At least this was the impression which they made upon many of us at that time.

Today I am ready to acknowledge that this negative reaction was in part the result of our own ignorance. But it was also due in part to the arrogance and cocksureness which we seemed to encounter in the writings of this new school. Indeed, I betrayed my own irritation on more than one occasion with childish petulance, a practice which relieved my mind at the time, but one which doubtless worked considerable damage to my scientific reputation. In the course of these experiments with fishes, for example, I found that transfer to distilled water, whether immediate or gradual, was usually fatal to the species on which I was chiefly working. Jacques Loeb, on the basis of some earlier experiments with the same fish, had made the statement that it could be kept in distilled water "without any visible injurious effects." In the published account of my studies, I made the supremely silly comment: "It is possible that Loeb would not regard death as a 'visible injurious effect.'" Here was the sneer of a tyro, directed at a man who had won an almost pontifical position among the physiologists of the country—"the yelping of the little terrier at the big Saint Bernard," as one blunt critic remarked to me. It is hardly to be wondered at that Loeb ignored my contributions in this field. Some years later, to be sure, I took occasion to apologize in print for this foolish utterance. However, the harm had been done. A natural consequence of this indiscretion was to retard and minimize the recognition which I received for a careful and rather extended piece of experimental work. That my contribution was far from monumental may be readily admitted. That it was not a negligible one I feel equally justified in claiming.

A yet bolder attack upon a "major" problem was my attempt to test the inheritance of certain "acquired characters" in white mice. This was before the "Lamarckian factor" in evolution had been quite as finally

abandoned as at present by those who concerned themselves with genetics. Being conducted at the laboratory of the United States Bureau of Fisheries, such an investigation as this necessarily had to play a subordinate role. It could only be allowed to fill in my odd moments during the progress of the biological survey soon to be discussed. Nevertheless, it was for several years my actual major interest, and I must confess that there were times when the "odd" moments were longer than the "even" ones.

My experiments consisted primarily in subjecting two groups of white mice, from birth onward, to considerable differences of temperature, noting any physical differences which might result from the treatment, and then ascertaining whether or not these same differences would reappear in the offspring of the two series, if these offspring were reared under conditions identical for both. Since I did not have the use of any artificial refrigeration apparatus, the differential temperature treatment of the parent generation had to be conducted during the winter months, and this was done during four different winters. The "warm" room was artificially heated, the "cold" one was merely exposed to the rigors of a New England winter. The average temperatures were thus widely different, though there was not even an approach to temperature regulation in either room.

To my satisfaction, I early discovered that measurable differences, and indeed readily visible ones, could be produced between the two series of animals which were exposed to these extremes of temperature. The tails and feet, in particular, were plainly longer in my warm-room mice than in my cold-room lot, the ears less certainly so, while there was a slight difference in the density of the hair, this time in favor of those reared in the cold.

Here, at least, were "acquired characters" to work with. Moreover, they were characters which fitted in

very well with known facts of the geographic variation of animals. Did we not have "Allen's Law" of the "enlargement of peripheral parts under high temperature or toward the Tropics?"

What about the inheritance of these artificially produced modifications? A few months, I told myself, should decide that. Actually it was only after two more years that I succeeded in obtaining an adequate generation of offspring from parents which had been modified in these opposite directions but which had themselves been reared together in the same room. The measurements which I obtained from this first critical series of mice gave me a distinct thrill. In respect to tail and foot measurements, the offspring of the cold-room and warm-room mice did, on the average, display the same differences as their parents, although much reduced in degree.

I was naturally much elated, and proceeded to publish these findings, though I was careful to avoid the claim that I had obtained watertight evidence for the "inheritance of acquired characters." However, I did favor that interpretation down in the depths of my heart, while a few Lamarckians promptly seized upon these results of mine as supporting their cause. Thus "Sumner's white mice" had their brief run on the biological stage of that day.

At this point belongs a sample of Mr. John Stark's inimitable drollery, to which I have already alluded. I had sent him a copy of my latest paper; also a photograph of myself, recently taken, with an improvised couplet penned on the margin. It was this last which served as the cue for his Miltonian epic, scribbled in pencil on some scraps of writing paper.

"He loved not men but rats and mice—  
What will he do in Paradise?"

Do?

Should he by act of special grace

Or by some lucky fluke find place  
 Within the gates of Paradise,  
 He'll change his love from rats and mice  
 To legless cherubs, and on them vent  
 His passion for experiment.

He'll catch some myriads on the sly  
 And clip their wings so they can't fly,  
 He'll raise or lower Heaven's heat,  
 He'll force those luckless ones to eat  
 Such rations as, nor Gods nor men,  
 Had ever eat and lived, till then.

That they're not feverish, to make sure,  
 He'll take at times their temperature,  
 He'll force the season they should moult  
 And note, for reference, the result.

He'll cross the breeds, in hope to gain  
 Thereby a new cherubic strain.

At last when aeons have run out,  
 And hope is changing fast to doubt,  
 He'll find that legs begin to sprout.

\* \* \*

A trifling million ages later,  
 As round the throne of the Creator,  
 One morn the choir, their voices raising,  
 In the regular round of praising,  
 Were suddenly struck all-a-heap—  
 As when into a flock of sheep  
 A crowd of hungry wolves do leap—  
 For lo! afar a nondescript  
 Cherubic band was spied approaching  
 With odds and ends of legs equipt,  
 Crawling, limping, slow encroaching.—  
 In dreadful consternation thrown,  
 Down dropped the choir harp and crown,  
 And with their haloes all awry,  
 Spread startled wings and off did fly.

Alas, several repetitions of this experiment yielded results which were not entirely confirmatory nor entirely consistent with one another. The parent generation, to be sure, underwent the same modifications consistently, and these may now be regarded as dependable direct effects of temperature upon mice. (They were corroborated by Przibram almost simultaneously.) The offspring, too, tended predominantly in the same direction, at least when all the data were thrown together indiscriminately. But the effects did not altogether agree in the different years' series, and various other features of the results now make me extremely doubtful of the significance which I was earlier disposed to attach to them. In the light of my later experiences with *Peromyscus*, it seems to me quite improbable that heredity had anything to do with the differences which I obtained between my stocks of second generation white mice of warm-room and cold-room parentage. I now know that unidentified nutritional differences, acting during growth, may affect in a high degree the proportional length of the animal's appendages, quite independently of any differences of temperature or of heredity.

And so my ambitious venture into the field of evolutionary fundamentals probably yielded little of importance to science, however much it may have added to my own stock of valuable experience. This is a rather bitter dose for me to swallow to-day, as I look back over my six published reports upon these experiments, with their two hundred and eighty odd pages and their imposing array of tables and graphs. I recall the weeks which I spent in preparing these papers; the months of labor expended in making measurements of the twenty three hundred mice comprised in the studies; the years during which I reared and cared for these animals and held them well in the foreground of my interests; and the high hopes which I once cherished of bringing these experiments to a successful issue.

That I should not have undertaken so ambitious a project with such inadequate equipment is easy enough to recognize now in retrospect. Plainly, I needed a strain of inbred animals, fed upon a standardized diet, and reared in rooms provided with automatic temperature control. Above all, I needed much greater freedom from other duties. There was, too, an element of downright bad luck working against me. On other occasions I have found it easy enough to rear white mice in abundance and in fair health. But throughout these experiments my stock was ravaged by an unidentified disease which led to the stillbirth or early death of three fourths or more of the broods at times when they were most needed.

However, I am not prepared to write off this entire "Lamarckian" adventure as a total loss. As a chapter in my own scientific education, this white-mouse episode was of great value to me. Much of the technique which I later employed in my *Peromyscus* program was developed during this period. One important lesson which I learned at this time, too, and which is never learned, I fear, by some biologists, relates to the meaning of statistical probability. It was not, at the outset, obvious to me that the "certainty" of some difference, statistically speaking, creates no presumption in favor of the particular interpretation which the author gives to that difference. If a thousand Methodists, picked at random in Chicago, should turn out to average a quarter-inch taller than a thousand Catholics from the same city—which is not at all impossible—this fact would prove nothing whatever as to the effect of church affiliations upon stature, even though the difference should have a statistical "significance" far too high to attribute to chance.

Then too, the blighting of my premature hopes in the course of that early Lamarckian test of mine has helped me in later life to restrain exultation over vic-

tories not yet won. Today, I cannot experience the thrill of initial success without hearing a mocking voice, telling me: "Good luck at first, prepare for the worst!" (These experiences, let me add, lend poignancy to my remarks on the "P.D.," to appear later in this narrative.).

The Biological Survey of the Woods Hole Region, to which I have already referred, was an undertaking conducted by myself and a number of my colleagues throughout a total period of some seven years. The original incentive to this undertaking was our desire to employ the Bureau's steamer "Fish Hawk," which it was then customary to "park" at Woods Hole during the summer months, and which ordinarily had little to do there. So we undertook an extensive dredging survey of Buzzards Bay and Vineyard Sound. In the shoaler waters near shore, the "Fish Hawk" was supplemented by two smaller craft, the "Phalarope" and "Blue Wing."

Having once embarked upon this adventure of unknown magnitude, we found ourselves involved more and more deeply as time went on. After a year or two, we were confronted with a dilemma such as I have faced more than once in my life. To see the project through to completion would mean an immense further expenditure of time and labor. To retreat now would involve a deplorable sacrifice of past efforts. Wisely or not, we decided to see it through, and the officials of the Bureau gave full support to the plan. But this could not be done if the program was to be restricted to the collecting work of the summer months. These labors would be altogether futile unless they were followed up by a still more extensive program of analysis and compilation. Plainly, someone would have to stay on the job continuously until it was finished. Furthermore, the work would have to be done at Woods Hole. I chanced to be the most available man of the group. For two successive years, accordingly, I obtained leave of absence from

my teaching position, but the end was not in sight. Then I resigned from the City College staff altogether.

In the course of our work, material was dredged at four hundred and fifty eight "stations." This was sorted out and the animal and plant species identified and listed, in part by ourselves, aboard the vessel, in part by various specialists to whom portions of the material were sent later. These data furnished the basis for an extensive series of distribution maps, depicting graphically the 250-odd species most frequently encountered. It fell to my lot during this long Woods Hole sojourn to analyze the physical and zoological data, and to make attempts in the direction of correlation and generalization. Likewise, it fell to my lot to write the greater part of the two-volume report. This may be said without detracting from the important share in the work which was performed by my collaborators, Messrs. Osburn, Cole and Davis.

For each of these "stations" the character of the bottom was recorded and a record kept of temperature and salinity. It must be admitted that our methods of procedure in these matters were not up to the standards employed in the most advanced oceanographic studies, even at that time. This lack was particularly evident in our characterizations of the bottom-deposits which were, in the majority of cases, quite insufficient, considering the close association between certain marine organisms and certain types of sea-bottom. We did not realize the seriousness of this defect until the task of digesting the field data was commenced. The earlier data were then augmented somewhat by means of supplementary field work.

Our results made it possible to plot out the widely varying distribution patterns of a great number of species. Of chief biological interest were the differences in their local distribution shown, in many cases, by mem-

bers of the same genus. These nearly related species were found to be adapted, for the most part, to somewhat different habitats. In many cases, too, it was possible to correlate these peculiarities of distribution with local differences of temperature or of bottom-deposits.

Such facts have an obvious importance for evolutionary theory, although in most cases their precise significance is not evident. To quote from our final report: "The bare fact that various closely related species do show decidedly different distribution patterns is one of great interest, for it shows that the slight morphological differences by which the species are distinguished from one another are oftentimes correlated with marked physiological differences sufficient to adapt the two to different habitats. Thus the assertion so often made that the slight structural differences by which we distinguish one species from another are commonly of no conceivable utility, and therefore can never have arisen through the action of natural selection, loses much of its force. . . . That natural selection has been the controlling factor in the origination and perpetuation of such specific differences, whether morphological or physiological, is far from certain. But that the characters concerned are in most cases too insignificant to be of selective value is also far from certain."

Another phase of this biological survey project was a census of the marine fauna and flora of a rather extended section of the New England coast, above and below Woods Hole. This was far more than a mere checklist, since it contained all accessible data of an ecological nature, and abundant references to previous records. Though primarily a compilation, it presented much new material, based both upon our own collecting operations and upon information furnished us by that pioneer observer and picturesque local character, Vinal N. Edwards.

The results of all these labors are comprised in two

volumes published by the United States Bureau of Fisheries in 1913. The various phases of this enterprise occupied the larger half of my time through a continuous period of more than three years, as well as numerous briefer periods before and after that. The reader will note that this biological survey occupied in part the same years as the white-mouse escapade lately described. As in that other case, I cannot regard the results attained as worth the immense amount of purely routine labor which I expended upon it during what might well have been some of my most productive years. That our report is far from being valueless, however, is shown by the considerable use which has been made of it. Its scientific value would doubtless be considerably greater were the records of the bottom deposits more precise.

\* \* \* \* \*

That there was a lighter side to our Woods Hole life need hardly be said. To many, even among those engaged in scientific pursuits, a summer at Woods Hole has always been primarily a vacation. There were none of the vulgar paraphernalia of a popular seaside resort, but there were abundant opportunities for boating and swimming and hiking. Even the "collecting-trips" were often more than half pleasure-trips, and to many of the participants the collecting of specimens was the least important object of these excursions. One of the incidental results of the wholesome and informal companionships which developed there was a considerable number of love affairs, some of which led to marriage. "Woods Hole matches" became almost proverbial. In a sense, my own marriage belongs to this class. My wife and I did not first meet at Woods Hole, to be sure, but a couple of summers there had much to do with the outcome.

There were always misogynists ready to hint that many of the young women biologists were not attracted to Woods Hole by any deep interest in marine life. Be

that as it may, it is significant that there was very little "scandal" in the scientific colony. If *liaisons* of that sort occurred, they were very infrequent or were very successfully concealed. One heard exceptionally little gossip among the scientific set, young or old.

To list the participants in our labors and frivolities at the old "Fish Commission" would serve no good purpose, and to present an incomplete list would be invidious. But there were a few of our habitués who could scarcely be omitted from such a narrative as this. Such, for example, were George H. Parker, Edwin Linton, Charles W. Hargitt, Raymond Osburn, Leon J. Cole, George G. Scott and Irving Field. And we must surely not omit that quaint and lovable character, the artist-naturalist Charles R. Knight, who was as much at home painting fishes as he was painting sabre-tooth tigers and dinosaurs.

Another artist who visited Woods Hole in my time—but only once, so far as I recall—was Abbott Thayer. His name is familiar to naturalists as the proponent of some original views on the subject of concealing coloration. Thayer's principles of "counter-shading" and "disruptive coloration" are real and important contributions to natural history. They are, too, peculiarly the contributions of an artist—an expert on light and shade. But Thayer's imagination was unfortunately not controlled by a scientist's skepticism. He would have it that all animal coloration was concealing. "Warning coloration" to him was a myth. Even the garishly striped skunk was concealingly colored, if seen from the point of view of the skunk's insect or rodent prey. This last he endeavored to prove to a group of us after an evening lecture in the old lecture hall of the Marine Biological Laboratory.

Abbott Thayer's demonstration of this point was one of the high-spots of Woods Hole comedy. Here, on the lawn of the Breakwater Hotel, stood the great artist,

holding on the ground an absurd little black-and-white triangle of cardboard, which represented the front elevation of a skunk, all the while expounding his views in an excited, high-keyed voice, while a line of creeping figures approached on their hands and knees—national leaders in biology, some of them—straining to get the mouse-eye view of the skunk, whose outlines were supposed to become obliterated when thus beheld!

I will relate the one social accomplishment which I developed during the Woods Hole chapter of my life. But first I must go back to the days of my fish-collecting trips among the Minnesota lakes. It happened that one of our party then had strong "Populist" sympathies, and subscribed to the official organ of that group of malcontents—I forget now its name. This was a noisy and abusive sheet, devoted to invective against "Wall Street," the banks, and the various other agencies which were crushing the farmer. The things which it criticized may well have deserved all that was said against them, but that is aside from the question. In a copy of that paper which our comrade had in camp, there was one choice passage which I promptly committed to memory and learned to declaim. After mention of a recent suicide, assumed to have been due to poverty, the editorial writer proceeded:

Go on thou horrid element of desolation and destruction, the gold-bug demon! And thou daily monster of the press—lead on for fools and knaves! But France had her revolution and America will have her's, when tears have all been shed and only blood remains!

This gem I treasured in my head for many years, till fitting occasion arose for its display. From what I have been assured by friends, I judge that I developed some real histrionic talent in declaiming it. At any rate,

my "anarchist speech" was much in demand on sailing parties and the like. It was my only "stunt." When delivered unexpectedly to a group which had not heard me before, the effect of this outburst appears to have been altogether terrifying. The maniacal gesticulations and facial contortions which accompanied its delivery led some of my listeners to believe that I had become suddenly and violently insane. The consternation which ensued on the deck of a small sailboat may be readily imagined. I do not recall, however, that anyone ever jumped overboard.

## CHAPTER XIII

### LA BELLA NAPOLI

The Woods Hole chapter of my life was interrupted by a six-months' journey to Italy, which I made in company with my wife and our four-year-old daughter. I chanced to be foot-loose after turning in the massive manuscript of the Biological Survey report, and felt that the more than three continuous years at Woods Hole had entitled us to a change. This rare opportunity was made possible through the sale of some of the stock which we owned in Mr. Stark's brick company.

In reality, our "journey to Italy" was confined to the vicinity of Naples. Insufficient funds forced an abandonment of our plans for a more extensive tour. My main objective at Naples, as previously, was the famous research laboratory of the Stazione Zoologica. But we took life leisurely, and spent many of our days visiting the numberless scenic and historical points of that fascinating region. Even in 1910, Naples still retained much of its primitive quaintness and beauty, filth and squalor. No dictator had arisen to deodorize the streets or banish the beggars or demolish the picturesque slums. Our vacations were spent on Ischia and Capri and yet more distant points. While at Ischia, we chanced to be mess-mates for some days with Julian Huxley, then a very young man. We were, I believe, the only English-speaking persons at the hotel at the time, and formed a very pleasant acquaintanceship.

So far as I can remember, the only other person with whom I became acquainted on this visit was a young Austrian named Schwartz. Our relations were rather peculiar. Schwartz talked no English, while I

talked little German. So our conversations were mediated through our pocket-dictionaries, his being German and Italian, mine English and Italian. But we usually succeeded in getting our meanings through, though our exchanges of thought were naturally considerably impeded.

A hike which Schwartz and I took one day has furnished me for years with a stock illustration of the courage-promoting action of alcohol. Our trip was an ascent of the precipitous volcanic peak of Epomeo. All went well till we came to a point where the trail led along a shelf of loose rock which sloped down rather steeply to the brink of a sheer precipice. My companion went on ahead without apparent fear, but I did not have the nerve to follow. I have always suffered from a distressing phobia on high places, regardless of whether there was any actual danger. However, a bright idea occurred to me. I suggested that it was lunch time and that this was a favorable place to eat it. Our lunch contained, as was customary, a quart bottle of wine. After the meal, I not only tripped nimbly across the terrifying slope, but to demonstrate my prowess, I skipped back and forth more than once. I have had similar experiences on numerous other occasions.

Is not the possibility worth considering that there may be normal constituents of the blood—endocrine secretions or what not—which have somewhat the same effect in promoting “courage” as alcohol? And is it far-fetched to suppose that the courageous man differs from the cowardly chiefly in the possession of a more bountiful supply of these natural stimulants? Other factors doubtless enter into the picture, such as acquired habits of action. But there are probably inherent propensities toward courageous or cowardly reaction-patterns quite in advance of experience. The display by very young mammals both of extreme fear and of aggressive self-defense favor such a supposition.

Were I so constituted physiologically, I might easily have become a slave to alcohol during my early manhood. Owing to some peculiarity in my physico-chemical make-up, however, I have never succumbed to habit-forming drugs, though I have had ample opportunity to do so. For example, though I started smoking clandestinely as a boy, I never became a smoker. On the infrequent occasions when I do smoke, I still find it mildly unpleasant. More curious yet, I purchased and used a bottle of one hundred tablets of heroin in the days when this drug was sold without restrictions as a cough remedy. Somewhat later, I was surprised to learn that it had been taken off the market as a dangerous narcotic. I have even read the statement that three repeated doses are sometimes sufficient to create the habit. Be that as it may, I have never used this drug, nor felt the least desire for it, since the experience here recorded.

Whether or not one becomes a heavy drinker, a confirmed smoker or a drug addict thus depends in part upon physiological peculiarities having no relation whatever to "character," "principle" or "strength of mind."

Italy is a greatly over-populated country, but the encroachments of mankind upon the scenic beauty of nature do not seem as flagrant or distressing as they do in many parts of our own country. The houses, even the hovels of the peasants, blend naturally into the landscape, and often add charm to it. Are these people really so much superior to our own in their esthetic sense? It is hard to believe this as one cautiously picks his way along the paving-stones of some street or scala and tries to forget the ever-present stench of human excrement.

The only large-scale desecration of landscape, according to our American models, which I remember seeing on the Bay of Naples, was the hideous Armstrong munitions plant near Pozzuoli. But this was built by a British concern, not an Italian one. However, my own

personal impressions end with 1910. It may be that recent industrialization has done to the Neapolitan water front what our barbarian manufacturers have been allowed to do at Niagara Falls. If so, we might question whether any amount of street sanitation could quite compensate for such a calamity. (What still more recent military operations have done probably staggers the imagination.)

The Pension Poli, where we lived while at Naples, had a more or less cosmopolitan clientele, and there were always a number of American guests. A few of these chanced to be friends of our own; others proved to be well acquainted with some of our friends. The world is indeed a small place, if one restricts his movements to points frequented by persons of the same general tastes and economic status.

An interesting episode during this visit was the witnessing of the celebrated "miracle" of San Gennaro, on the first Saturday of May. I happened to go to the church at an early hour with Dr. E. G. Conklin, and we were fortunate enough to forge our way to a vantage point, very near the priests who conducted the show. This shallow hoax was apparently accepted at face value by the swarming crowd of worshippers who attended the performance. The cries and supplications of these people, during the warming-up process of the "blood," and the shouts of joy which greeted its final liquefaction, were highly impressive. That we have to do here with some simple physical phenomenon—probably the melting of a colored heavy oil when slightly warmed—no educated person would probably question. And yet this transparent fake is perpetrated thrice annually in the cathedral church of the second largest city of the Pope's own land of Italy, presumably with the sanction of the Roman Catholic hierarchy. One must credit the scholars of the Vatican themselves with enough intelligence to recognize the real

character of the deception. Yet any of us who should raise his voice in protest at such quackery would be howled down with the cry of "religious intolerance!"

The personnel of the Stazione had greatly changed in the ten years since my last visit. The elder Dohrn was gone, so was Eisig, so was Paul Mayer. Lo Bianco died suddenly during our present visit. I went to Naples in 1910, expecting to continue my experiments upon white mice. Very fortunately for me, as it turned out, I was unable to secure the mice for these experiments and was led into a very different field of investigation. My first reaction to this failure to carry out my original intentions was a keen sense of disappointment. It left me with no "problem" in view. Then I set about to look for one. I frequented the exhibition aquaria and sought inspiration from these. I noted, among other interesting things, the striking conformity of various bottom-dwelling fishes to the ground on which they rested. There was, of course, nothing new about this. The phenomenon of concealing coloration had been widely discussed since the days of Darwin and Wallace, and the changeable coloration of certain animals had been known for hundreds of years to many besides naturalists. But here there seemed to be evidence that the fishes not only changed their general color-tone, but that they changed the distribution of the colored areas of the skin—their pigment-pattern, in fact. Flounders, upon a background of sand, displayed a nearly homogeneous shade; those lying on gravel had a plainly mottled appearance, and the type of mottling conformed to a remarkable degree with the general texture of the bottom, and the degree of contrast among its elements. The effect of all this was to still further decrease the visibility of the animal.

Here, then, was the "problem" for which I was seeking. How does the fish do these remarkable things, and what are the limits to its capacity? There was fortunate-

ly at hand a supreme camouflage artist, a small flounder which could be captured in the Bay of Naples. I commenced what proved to be one of the most interesting and satisfactory pieces of investigation which I have undertaken. It is also, with a single exception, probably the best known of my researches. And it is one which has led to extensive further developments in my later life.

For several months, I offered these fishes backgrounds to copy, both natural ones and highly unnatural ones, and I kept full photographic records of the results. After that, for some reason, the fishes ceased to be available, and I was obliged to exchange the role of zoologist for that of tourist. This was also perhaps for the best.

The ability of this fish to adjust both its color-tones and its pattern to backgrounds which it never before could have experienced was remarkable indeed. The theoretical issues raised by these experiments far transcended the mere phenomenon of color change in flounders. However, my fish's power to copy a pattern was limited to displaying a rough approximation to the distribution of light and shade in its substrate. The animal could not reproduce definite geometrical figures upon its skin, as some of the commentators upon my work have represented. And here I refer not only to popular accounts in the press. At least one biologist of great repute offered an interpretation of these experiments which implied the ability of the fish to project its own visual images upon its skin, while a professor of philosophy, now known as the author of more than one "best seller," based upon this assumption a far-reaching theory of the nature of space-perception in general!

This seems a suitable place to remark that I have long been impressed by the carelessness of many scientific men in citing the work of others. Citations are made, and indeed imposing arguments sometimes reared upon them, which prove only too conclusively that the writers

are almost wholly ignorant of the contents of the articles to which they make reference. This experience has become so familiar to me that I have ceased to be surprised by it when I meet with a reference to my own work in the writings of another biologist. Qualifications to one's statements, however emphatically expressed, are likely to be overlooked, leaving one as the definite advocate of an interpretation which he only suggested as a possibility. One author, whose writings I had been perusing, shortly before writing these lines, actually reverses the major conclusion which I drew from an extended piece of work, even though this was the burden of my entire discussion throughout a hundred-page paper, and was clearly indicated by the title itself! In this case, it happened that my point of view on the essential theme agreed with that of the other writer. I was naturally amazed to find myself transferred to the opposing camp! But it more often happens that the misrepresentation of another's conclusions results from the desire on the part of a writer to find material in support of some theory which he is endeavoring to promote.

In other words, as I have already hinted, *Homo sapiens scientificus* is nothing but a human being, endowed with much the same frailties as the rest of his species. *Much* the same, though I think we may fairly claim that lapses from a strict adherence to truth are less frequent in our circle than among those engaged in most other vocations.

## CHAPTER XIV

### BACK AGAIN TO CALIFORNIA

My family and I returned from Naples in June, 1910, and proceeded at once to Woods Hole, which was now the only home that we had. But beyond the coming summer months, I had no salaried position in sight. The year-round position with the Bureau of Fisheries, which I had held for several years past, was merely a temporary job, calling for reappointment at three-month intervals. It was created for me in order to make possible the preparation of the "Biological Survey" report. Now that report was written, leaving me with only the director's salary of a hundred dollars a month, for the three summer months. The directorship of the laboratory at Woods Hole had always been an informal arrangement within the Bureau. The director was a temporary employe, with no civil service status, whose chief salary was presumed to be derived from other sources.

Fortunately, we had the use of excellent living quarters in the residence building, and there we were allowed to remain throughout the year, even after the winter salary was discontinued. Fortunately too, we drew an additional income of about \$750 per year from our own private resources. But \$1050 per year was little enough for a family of three to live on, even with no rent to pay.

The year and a half, following our return from Italy, was a period of much anxiety for us. My first efforts to secure a suitable position met only with disappointment. My seven years' teaching at the New York City College was of no avail in trying to find an opening in a university, particularly as this teaching experience had ended four years earlier. And I was not reduced to

such straits as to apply for reinstatement at the "C.C.N.Y." In fact, I valued myself pretty highly for a fellow who was skating on such thin ice. I wouldn't consider very minor positions, nor very minor institutions. And I wouldn't think of becoming a mere teacher. My primary object was research, and I took no pains to conceal the fact. It was doubtless my lack of adaptability, quite as much as my lack of teaching experience, which blocked my way to a desirable position. I was not at all the kind to jump in and make the best of a bad situation, trusting to the future for something better.

There were jobs in the federal Department of Agriculture; there were others in the state agricultural experiment stations. In such positions, one was expected to devote his time to economic problems, or at least to problems which could be so represented in talking with one's constituents. I had a ready-made problem of my own, but this did not fit into the plans of the Department of Agriculture. Nevertheless, I bombarded some of the officials in charge with persuasive letters and project-statements. I still nursed the hope that I might be able to help clear up the "acquired characters" question if I were only given a real chance. Alas, the results were hardly more encouraging than those which had rewarded the efforts of one "Algernon S. Bleeker" some fifteen years earlier!

And so the fall of 1911 came around and I was still without a job. At length my friends in the Bureau of Fisheries intervened in my behalf. The position of Naturalist on the exploring vessel "Albatross" had become vacant and I was advised to take the required civil service examination. I received the appointment, and a few months later I was back again in California, not far from the spot where my boyhood's recollections commence.

It had been my expectation that the Albatross position would take me on long ocean voyages. In fact, I

had resigned myself to renouncing home life henceforth for periods of indefinite duration. But it turned out very differently. The old steamer was not in condition for a cruise of any length, and the Bureau could not then obtain sufficient funds for the needed rehabilitation. And so, we were restricted to San Francisco Bay, the vessel's home port. This afforded a possible program of work, to be sure, but a very different one from what we had contemplated.

Professor Charles A. Kofoid and some others at the University of California had been considering for a year or more the possibility of a biological survey of San Francisco Bay, and as I had recently supervised a similar project at Woods Hole, I seemed a fitting person to take charge of such an enterprise. The Bureau of Fisheries was favorable to the plan, and it was forthwith undertaken as a joint project of the Bureau of Fisheries and the University of California, with some other local institutions cooperating to a certain extent. A committee was appointed to carry out this program, consisting of the commanding officer of the *Albatross*, Professor Kofoid and myself.

About two years were thus occupied by my collaborators and myself. Roughly speaking, the first of these years was devoted chiefly to field and laboratory work, the second chiefly to compiling our results for publication. During the former period, the vessel was employed in general about three times a week, making dredge and tow-net hauls, taking soundings and obtaining water samples. On the alternate days we were occupied with sorting the material collected, titrating the water samples, and other tasks, which were carried on at the University. During the two years of this survey, and for an additional year thereafter, my family and I lived at Berkeley, where we already had some good friends connected with the University. On boat days, I took the long trip to

Sausalito, where the Albatross was anchored, this trip involving one ride by train and two by ferry.

Even those who have merely crossed San Francisco Bay on the ferryboats know something of the beauty of that body of water and its environs. But to really appreciate its fascination, one must cruise throughout its length and breadth, and do this many times. For the atmospheric conditions are never twice the same. There is seldom lacking a wealth of fog and clouds, now reflecting the sunlight brilliantly, and again dense and gloomy, threatening rains which seldom fall. At one moment, the lofty hills may be capped with clouds, at another enveloped at the base in dense fog, leaving their summits to rise freely into a clear sky. And these hills—mountains they are, some of them—skirt the bay for fifty miles on each side, with an endless diversity of outline. An endless diversity of color, too: brown or green, or black, or the violet with which distance tints them all alike. For the passenger on a moving boat, the panorama changes continually from moment to moment.

The Albatross, though belonging to the Bureau of Fisheries, was manned and officered by the Navy. The total naval personnel consisted of about seventy-five men. The civilian staff consisted of only four of us, the naturalist, two assistants and a clerk. The relations between the civilians and the Navy men were somewhat anomalous. The Bureau of Fisheries owned the vessel, but the Navy was in actual possession. The Naturalist, representing the owners, had authority, in theory at least, over her movements. But the actual authority was vested in the commanding naval officer, whose position did not permit him to take orders from a civilian, though he was free to act upon *requests*.

I presume that such anomalous situations are not uncommon in government circles, the smoothness with which they operate in practice depending, of course, upon

the personalities chiefly involved. Such a situation demands a high degree of tact, and particularly that type of good sense which enables one to know when to insist and when to yield. That these are traits which have never been characteristic of me should already be clear. I have never cultivated the art of indirect approach to a desired end. And I have never learned the balance between yielding too much and too little. As often as not, I have failed to press my claim to something to which I was in every way entitled, or insisted doggedly upon something which it would have been wiser to relinquish. In many cases, I have been uncertain which was the proper and dignified course to take. On the Albatross, I characteristically neglected to inform myself regarding certain rules of precedence which regulated the relations of the personnel. When going ashore in a landing boat, for example, the passengers were supposed to leave the vessel in an order the reverse of their rank, the common sailors leaving first and the Captain last. But where did the civilians come in? I did not know and I failed to inquire. On occasions, I found myself courteously deferring to the Captain, while he, with some irritation, would motion me to precede him. And this uncertainty in matters of ceremonial extended to the more vital questions of relative authority.

During my two years' term as Naturalist on the Albatross, we had two commanding officers. The first was an Annapolis graduate, a Commander in rank, who later became a Rear Admiral. Even at that time, he felt that he "had too much rank" to be holding such an unimportant post as captain of a fisheries vessel. He was courteous enough, to be sure, in his stiff way, but he was a stickler on questions of etiquette, precedence, etc., and never once let us forget that he was the biggest man aboard, whether naval or civilian. Then there came a change. A new commanding officer was sent us, a Lieu-

tenant-Commander who had risen from the ranks. In my first interview with him, I commenced with the usual deferential approach, acquired from a year's contact with his self-important predecessor. The new Captain stopped me short. "You are on the wrong tack," he said, "I am here to carry out your instructions. You tell me what you want done, and I will do it to the best of my ability." This commenced a year of thoroughly friendly association.

Despite the anomalous situation referred to, my relations with the officers of the Albatross were on the whole agreeable. My only real friction was with one of their number who had acquired an almost national reputation as a trouble maker. He was a man of distinctly psychopathic personality, though possessed of exceptional gifts in some directions. He aspired to be an amateur naturalist, and indeed he might have made a place for himself in science had he possessed sound moral principles and steadfastness of purpose. None too scrupulous in his methods, with a jealous disposition and a genius for invective, his life appeared to be one long quarrel with nearly everyone with whom he came into contact. His duties on the vessel, which were real and important ones, were left in charge of a subordinate, while he spent a large part of his time ashore, fomenting a factional feud which was then raging in the California Academy of Sciences. Efforts to dislodge him from the Albatross were for long unsuccessful, owing, it was generally believed, and as he openly boasted, to some powerful political pull. In a life of seventy years, I have encountered few men more nearly lacking in every admirable quality.

The second of my years with the Albatross was devoted to the preparation of the report. It was "A Report upon the Physical Conditions in San Francisco Bay."\*

\*By F. B. Sumner, G. D. Louderback, W. L. Schmitt, and E. C. Johnson.

The biological material was turned over to a number of specialists for identification, and has been made the subject matter of several subsequent reports by various authors. None of us of the Albatross staff had the requisite familiarity with the commoner local species to enable us to identify any considerable part of our material in the field, as was done by our Woods Hole group at the time of our "Survey" there. Thus this first report dealt only with the conditions of the physical environment. It has since been used profitably by a number of those who have made ecological studies in San Francisco Bay. It will probably continue to have a limited usefulness in connection with such studies. But from the standpoint of scientific achievement, I must rank it, as I did the Woods Hole report, as distinctly low-grade ore. Not that the work was carelessly done. The methods employed were, I think, reasonably accurate, and our labors were performed on the whole conscientiously. But the results hardly ever rise above the purely descriptive plane. This is little in them on which to base a scientific generalization of more than very limited scope.

Thus I could not see any promising scientific future for me aboard the Albatross. I was not at all attracted by the thought of remaining throughout much more of my life a routine cataloguer of matters that did not particularly interest me. Moreover, I was still intrigued by the notion of carrying on a long-time program to test the role of the direct effects of the environment in evolution. And in this notion I found a number of sympathizers at the University of California. But none of the regular departments could undertake such a project. It was at the suggestion of Professor Kofoid that I wrote to Professor William E. Ritter, who had, but a few years before, established the Scripps Institution for Biological Research at La Jolla.

That institution was still in a somewhat experimental stage. Only one rather small permanent building had thus far been erected. There were, besides the director, only two resident staff members. The financial outlook was indefinite, though on the whole promising. Moreover, Ritter was a man of far-reaching ideas, and was not afraid to experiment. My proposition came at a favorable psychological moment, and met, from the outset, with sympathetic reception from him. A committee of those most interested was chosen to draft a definite program of action. This committee included, besides Ritter and myself, several members of the university faculty.

My own project statement for the field and laboratory study of certain races of native rodents was accepted by the committee practically as written, and was later endorsed by the principal organization of Pacific Coast biologists. These circumstances seem rather surprising as I look back upon them, in view of the highly ambitious scope of the investigations proposed, and my rather naïve confidence in an easy solution of various major problems of biology. However, it was merely an endorsement of the project, involving no appropriation of funds then in sight. But it seems to have served an important purpose in influencing the financial backers of the Scripps Institution. Before long, I was appointed a permanent member of the staff of that institution, with an express mandate to carry out the proposed program of investigation, and generous funds for its support. This was toward the end of the year 1913. The program in question was not abandoned until 1930.

## CHAPTER XV

### A BIOLOGICAL LABORATORY THAT WAS DIFFERENT

The Scripps Institution for Biological Research, as that establishment was then called, was the outcome of a series of endeavors by Dr. Ritter and some others to create a seaside laboratory in connection with the Zoology Department of the University of California. These earlier ventures commenced as far back as 1892, and included the occupation of very temporary quarters at five different points on the California coast. The turning point in the fortunes of our group of scientific prospectors came when they enlisted the active support of Mr. E. W. Scripps and his sister, Miss Ellen Scripps. What had been a migratory summer camp became a permanent station with a resident staff. The present site, north of La Jolla, was acquired in 1907. At about the same time, the institution was deeded to the University of California, and became a department of that great educational establishment.

The laboratory had previously been the property of the "San Diego Marine Biological Association," and was originally intended as a place for the study of marine life. But with its annexation to the state university, the scope of the institution was broadened and the word "marine" was deliberately dropped from its official title.

Locally our laboratory was known as the "Biological Station," when it was not called by the more flippant name of "Bug House," and the grade over which the main highway passes through our grounds became the "Biological Grade"—a name which has doubtless puzzled many a traveler.

It was during this period of unrestricted biological outlook on the part of the Scripps Institution that I became a member of its staff. For many years thereafter, my studies of the races of wild mice were regarded as altogether relevant to the liberal, if somewhat nebulous, "program" of the "Biological Station."

The Scripps Institution, in those days, might have been characterized as an unrealized dream. It was often difficult for the outsider to reconcile what seemed to him the rather vague and grandiose official accounts of the institution with the actual personnel and plant which he found there. Indeed, there seemed to be, at least two quite distinct Scripps Institutions. On the one hand was the director's ideal, which he often seemed to forget had not yet materialized. This was a thing without apparent limitations as to personnel or physical equipment, an establishment of national if not international importance, having a special mission to fulfil in the scientific world—a place of great achievements, guided by a unique set of fructifying ideas. On the other hand was the visible concrete Scripps Institution, with its tiny staff, which was not composed of supermen, and its budget which was but a very small fraction of a million dollars a year. One might be tempted to call this last the *real* Scripps Institution. But I must insist upon attributing a certain measure of reality to the first. To the credit of both Dr. Ritter and his successors, it must be recognized that the gulf between the ideal and the actual, though still wide, has steadily diminished.

In theory, the work of the institution followed a unified, if somewhat inscrutable "program" of research. In reality, the subjects under investigation were extraordinarily diversified, comprising such topics as the philosophical implications of biology, the vertical migration of marine plankton organisms, ocean temperature and circulation, the instinctive behavior of the California

woodpecker (one of the director's own special topics), and my own studies of geographic variation and heredity in our native races of mice.

Mr. Scripps, at that time, even became mildly interested in a project to establish a colony of anthropoid apes upon our campus. There was some correspondence with Dr. Robert M. Yerkes, an internationally known student of these animals, and "E. W." was prepared to supply some thousands of dollars toward the initiation of the project. But he was not disposed to furnish the very considerable funds necessary to carry it through on a sufficient scale, and the ape colony was finally located in Florida.

Dr. Ritter rather recently quoted a letter from Mr. Scripps in which the latter stated: "I have desired to found or incorporate with the Scripps Institute for Biological Research a department of sociology." This last was later founded by him at Miami University, Oxford, Ohio.

Concerning the circumstances which led to the later *volte-face* in the institution's policy, and its transformation into an oceanographic station, I shall speak shortly.

To all who really knew him, William E. Ritter looms large, not only as a most lovable personality, but as an independent thinker and man of high scientific and social ideals. His constant interest, both in the scientific achievements and the personal welfare of the members of his staff, was an outstanding feature of our lives at the institution, throughout his term as director. Every new bit of information gathered by one of us, whatever its subject matter, seemed to fit, in some way, into his framework of thought, and often as not served to illustrate some one of his favorite ideas. He was fond of discoursing with us, singly or in groups. These discourses were often stimulating, though we did not always find them easy to follow. Ritter was far more successful as a thinker than as an expositor of his own ideas.

One of Dr. Ritter's progressive ideas led to the establishment of a considerable measure of local self-government for the Scripps Institution, and this was maintained for a number of years after the institution had become an organic part of the University of California. Our scientific staff, along with the president of the university, Mr. E. W. Scripps, Miss Ellen Scripps and a few others, constituted a "Local Board," which discussed our problems, scientific, financial and administrative, and took action upon them. This board functioned, I believe, efficiently on the whole until it was abolished by the University, and sole responsibility was centered in the director. The board meetings were then replaced by staff meetings having only advisory powers.

For a number of years, one of the most interesting features of my connection with the Scripps Institution was my acquaintance with that remarkable man, E. W. Scripps. I shall not pretend that Mr. Scripps and I were ever "thick." Without doubt, "I was the thickest of the two," as Harry Lauder would say. But for a number of years I saw him at intervals, and had some extended conversations with him. "Conversations," did I say? Well, no, not exactly that. They were not dialogues, they were monologues. But I was nearly always an interested listener. The wealth of the man's information was immense. And the fertility of his ideas was almost equally impressive, even if at times they seemed to me utterly indefensible. Indeed, I think that he himself frequently recognized them as such, and merely wished to try them out in the presence of an auditor and see where they would lead him.

Scripps's primary interest in the institution was in Ritter. He more than once said that what he and his sister were really doing was "endowing Ritter," implying that their interest was a personal one, without much regard for the research establishment which bore the fam-

ily name. This could not have been altogether true, however, for very substantial donations were made to the station after Ritter's resignation, both by the older and the younger generations of the family.

For a number of years, "E.W." was a familiar figure at the institution, with his high boots, his still somewhat reddish beard, his rather querulous voice, and his half-buttoned vest, liberally sprinkled with cigar ashes. He would drive over in his limousine from his home at Miramar, ascend the stairway of the laboratory building and call for Ritter. In Ritter's absence, I was frequently the second choice. In such cases, we sat down for an hour, or two, or three, and talked. Or at least he talked. Fortunately I was not expected to say much. Occasionally his visits would last far beyond the dinner hour. My wife could watch Mr. Scripps's car from the house on the hill to the north, and plan for my dinner accordingly. But the Scripps family at Miramar were not so fortunately situated. I remember on one occasion replying to an anxious telephone call from his home some time after seven o'clock, asking what had happened to him. I must have been an exceptionally good listener.

However, I really profited greatly from these prolonged visits from "E.W.," even though they were not always convenient as to the hour of the day, and I much regretted his departure for the East some years before his death. My own indebtedness to him extended far beyond the intellectual stimulus derived from his monologues. He was a generous supporter of my scientific work, particularly in defraying the cost of my far-flung collecting trips in quest of *Peromyscus*. There was sometimes a thoughtful personal touch in these donations. On one occasion, he insisted that my wife should participate in a field trip to the mountains, on another that I should invite Professor C. J. Herrick, who happened to be at La Jolla—the bills, of course, to be paid by E.W. But

his outstanding gift to me was the residence lot on which I now live, perched on the top of the high cliffs to the north of La Jolla, and commanding a matchless view of the ocean and the neighboring coastline in both directions.

E. W. Scripps was a man who defied classification according to conventional human standards. Many of those who attempted such an evaluation of him were led to very warped views of his nature. For my part, I never made a serious attempt. In spite of all the contacts which I had with Mr. Scripps, and all the frank self-revelation in which he indulged, I never felt at all intimate with him. And in spite of my own conspicuous obligations to him, I was repelled at times by what seemed his ruthlessness and indifference to the feelings of others. But of one thing I am sure. He was not the callous and dissolute creature that many horrified old ladies seemed to imagine. He was a supreme individualist, plainly enough, but he was abundantly capable of acting upon generous impulses. And he had exceptionally high standards of honesty and public service in journalism, despite the tendency of his papers to cater to popular tastes in the presentation of news. "My newspapers are vulgar newspapers," I remember him saying. On the other hand, they certainly did not belong to what Upton Sinclair has called the "kept press."

For a long term of years I enjoyed what must have seemed to an outsider to be an ideal opportunity to conduct scientific research. I was receiving a salary—not a large one, but more than a living wage—for doing exactly what I had wanted most to do. My project was supported by funds which were adequate for the purpose, and which enabled me to spend a month or two in the field nearly every year, collecting, observing and enjoying nature. I was not hampered by a teaching schedule, and very little, in fact, by routine duties of any kind, with the important exception of those involved in my own main program of research.

I must hasten to add, however, that duties of this last sort were by no means negligible. In fact, they were at times not only onerous, but altogether monotonous and uninspiring. The reader of romantic, third-hand presentations of scientific discoveries gains the impression that the devotees of science lead an idyllic sort of existence, merely putting questions to Nature and receiving prompt and unambiguous answers. What the layman does not realize, what even the beginner in science usually does not realize, is that nine-tenths or more of every program of scientific research consists of routine drudgery, almost devoid of any intellectual element. Likewise a large proportion of those questions which the priests of our cult put to Nature are either not answered at all, or are answered in such ambiguous terms that we are no better off than we were before.

One must bear in mind, too, the blighting effects of our isolated life, out there, well outside the limits of La Jolla, particularly before anyone but the director owned a car. Here was a small group of ultraspecialized specialists, dwelling alongside a community of laymen, knowing little of our work and caring even less. Save for the director's sympathetic interest in everything that was going on in the laboratory, there was very little real intellectual comradeship among the staff. Despite the theoretical cooperative program in which we were all supposed to be engaged, each of us kept to his own little cubicle and seldom left it. We lacked both the stimulation and the corrective restraint which come from competitive endeavor and intelligent criticism by fellow-specialists. Rarely did we visit other centers of learning, even Los Angeles or Berkeley; and rarely did we see scientific guests, except as transients, making us a few hours visit. And so we tended to become more and more introverted, and more and more lacking in perspective. The rigid limitations of the Scripps Institution

and its component members were often forgotten. At times we seemed to feel ourselves divinely commissioned to expose the errors of our less favored scientific colleagues elsewhere.

However, only one of our number ever accepted this commission seriously. It chanced that before the crisis came, he had been detailed to give a semester's work to undergraduate students at Berkeley—a well-intentioned effort of the part of our director to divert this young man's exclusive attention from the intracranial world. But this prophylactic measure came too late. After a hectic career in the classroom, and a fantastic attempt to end the World War by the application of mathematics to biology, our colleague had to be sent to a sanitarium for psychopathic patients. Within a few months, to be sure, he had recovered sufficiently to return to La Jolla. He died from other causes some two years later. I need hardly add that this case was altogether unique in the history of our institution.

One of the most salutary influences in preserving my own mental and physical health during this long period of intellectual isolation was the opportunity which my work afforded for making extended collecting trips in search of my objects of study. These deserve, I believe, a separate chapter.

Commencing with the year 1922 or earlier, there gradually developed a rather sweeping change of outlook on the part of those in control of the destinies of the Scripps Institution. Mr. E. W. Scripps, in failing health, moved east to stay, and with this move he lost his active interest in the institution which he had played such an important part in founding. But his close friendship for Ritter continued, as also his financial support of some of Ritter's scientific projects. For several years, Dr. Ritter was cooperating with Mr. Scripps in the founding of a news service for the dissemination of accurate re-

ports of scientific progress. Thus came into being the now well and favorably known *Science Service*. Ritter, too, spent much of his time in the east during this period, and thus lost contact to a large degree with the "biological station" of which he was still director. But he was thinking of its future, to follow his own impending retirement.

As I have already mentioned, the first plan of Ritter and his associates contemplated the building up of a marine biological station. Writing as late as 1911, Ritter stated his program as being in essentials "a biological survey of the waters of the Pacific adjacent to the coast of Southern California." Rather a stupendous project those will say who have had anything to do with biological surveys! Only a year later, however, when the institution was merged with the University of California, the word "marine" was deleted from its name. Mice and monkeys were regarded as relevant to our "program." But the next tack on our institution's somewhat variable course took it well to seaward again.

Dr. Ritter had for years been evolving a system of biological philosophy, the central tenet of which was that the actual unit to be reckoned with by the biologist should be the organism itself, rather than its component cells, genes, molecules, or what not. He insisted that the whole is just as essential in accounting for the activity of the parts as the parts are necessary in accounting for the activity of the whole. Ritter's contributions in the field of biological philosophy, though not wholly new, were real ones, and they drew the respectful attention of a number of prominent thinkers in this field. But appreciative readers appear to have formed a small minority, and the launching of the "organismal" view of life created no great stir in the biological world. Unfortunately, Ritter was always disposed, it seems to me, to magnify the differences between his own views and those

held by the majority of biologists. The others have too often seemed to him to be worshipping false gods.

This feeling of alienation, on Ritter's part, from the dominant groups of biologists in this country had, I believe, a most important bearing upon the fate of the Scripps Institution for Biological Research. It must not be allowed to degenerate into just another biological laboratory, devoted to the ordinary run of biological problems. La Jolla must not become "another Woods Hole." The uniqueness of the institution must be maintained at all costs! And so, on one fateful day, the director called the staff together and told us that it had been decided to convert the "Biological Station" into an institution of oceanography—the first in the United States.

By those who were already working upon problems of the sea the change of policy was naturally welcomed. To a student of land mammals it was just as naturally regarded as a deplorable mistake. My own original program of work had been safeguarded, it is true, by the provision that it should continue undisturbed. But I foresaw as much as anyone what an incongruous situation it would be for a considerable proportion of the income of an oceanographic institution to be devoted to the study of mice. And I soon realized the growing difficulties of trying to hold together such a house divided against itself. Inevitably, though voluntarily, I conformed my own working program to that of the reorganized Scripps Institution of Oceanography.

The period of transition between these two regimes for me covered several years of mental conflict. I was naturally loth to leave a field of investigation which I had virtually made my own. Evidences of outside recognition were accumulating. Some of my scientific friends expressed themselves emphatically upon the unwisdom of my work at the Scripps Institution being displaced by something entirely different. It was at about this

time that the Carnegie Institution of Washington made me a liberal grant for the support of these studies for a period of three years after I had originally announced my intention to abandon them.

At the end of these three years, no further support for the *Peromyscus* project was in sight, and I settled down to a program of investigation upon fishes, one which is still in progress.

## CHAPTER XVI

### THE PIED PIPER OF LA JOLLA

I have said little thus far of my actual doings during those seventeen years as a "peromyscologist." But, such an omission would hardly be allowable since the results of those labors probably constitute my chief single claim to whatever recognition I have received as a biologist.

A few weeks or a month or more out of most years was spent in the field trapping. Pleasure jaunts these field trips may have seemed to my colleagues of the staff who stayed behind in the laboratory. Interesting they truly were, and redeemed by the salutary contact with nature. But they involved, on the whole, the hardest work which I performed during that period. These trips, at first, did not extend beyond the limits of California, but California is a large state, and the distance between the Oregon border and the Colorado River, opposite Yuma, is about the same as that between New York and Jacksonville, Florida. And the climatic differences in the former case are considerably greater. Later, my journeys took me to yet more distant points—to Arizona, and finally to Florida and Alabama.

In all these various places, it was my task to collect living mice—wild mice of the abundant native genus *Peromyscus*. More customarily I traveled alone, though occasionally I was accompanied by a fellow biologist or by an assistant. I must indeed have seemed an eccentric figure while on these wanderings—a sort of modern Pied Piper, who rambled through the mountains and deserts, calling the invisible hosts of rodents from their lairs. To the rural inhabitants of the regions traversed I probably passed for a lunatic of the more harmless type, pursuing

my phantasies where no one could molest me. And my assurance that all this was done for the University of California was probably set down as merely another of the poor victim's delusions. Nor did any explanation which I could give of the purpose of these activities serve to make my enterprise seem more respectable.

However, evidence was usually forthcoming, before the end of my stay at any particular point, that this harebrained mouse catcher was really in the employ of the University of California, and that the funds with which he carried on this work were, in part at least, public funds, wrung from the suffering taxpayer. Whereupon, the bystander was likely to go his way, registering his opinion of the entire state university, and of the "nuts" who tolerated such damned foolishness. Or, if a little more open-minded, he might be disposed to give the stranger the benefit of the doubt, and to grant the possibility of reasons which the layman did not happen to understand. His inquiry commonly followed a set formula. It was sometimes uttered apologetically, sometimes with an air of ill-disguised contempt: "What is the use of all this?"

On one collecting trip in Arizona, I made a very successful catch upon a ranch conducted by an intelligent Hopi Indian. As he saw me taking up my traps, well stocked with living mice, his curiosity knew no bounds. "What you going to do with them?" he asked. "Take them back to California," I told him. "Why—ain't they got no mice in California?" Then came the inevitable inquiry as to the use which would be made of the animals after their arrival in our less favored state. Well, I found this Hopi Indian just as difficult to enlighten in these matters as I have found the average white man to be, no more, no less. He looked wise and said nothing. Also, it was quite plain that he understood nothing. How frequently do we meet with a suc-

cessful business or professional man who has as little grasp of the real meaning and value of science as this Hopi Indian! I expect to sermonize upon this favorite theme in a later chapter.

These solitary tramps through unsettled country served to gratify my keen love of natural scenery. They also led me to acquaint myself in a measure with the flora of the various localities visited. I was never tempted to become a systematic botanist, but I have long derived a good deal of satisfaction from being able to recognize the commoner or more interesting plants of a neighborhood. In fact, it is likely to be a source of actual mental discomfort, when I travel in new territory, to find numerous trees and shrubs which are totally unfamiliar to me. This feeling vanishes as soon as I have succeeded in "identifying" them. It is not so much a matter of learning the specific names of these plants, though I commonly endeavor to do that. What interests me primarily is their systematic position—their relationship to other plants. Much of my interest in biology—my only interest in taxonomic biology—is the recognition of essential similarities amid the ever-present diversity of living things. I derive a distinctly esthetic satisfaction from contemplating the innumerable variations of the same fundamental theme, such as we find in a large genus of plants or animals having diverse habitats.

It is largely considerations such as the foregoing which cause me to resent so hotly the continuous "splitting" of the genera of plants and animals by some of our systematic specialists, with consequent changes in their "scientific" names. For these generic names, I need hardly point out, are our verbal clues to the nearer kinships between species. To quote an earlier article of mine, "The question raises itself whether the detection of resemblances in nature is not as important as the detection of differences. Is it not largely this unity in variety—

or variety in unity—which fascinates the true nature-lover, be he an amateur collector, a beginning student or a professional biologist? It can hardly be denied that the extent of our recognition of such unity is greatly influenced by the *names* which we find applied to things.”

Of all these collecting trips, none stands out more vividly and pleasantly in my memory than one which I made with Joseph Grinnell to Death Valley in 1920. The tourist who engages passage today in Los Angeles for a bus tour to Death Valley may not realize that as recently as twenty-five years ago a trip to Death Valley was something of an adventure. It was particularly so if one chose the route which Grinnell and I followed: Mojave to Johannesburg, to Trona, to Ballarat and on to the valley through Wild Rose Canyon and Emigrant Pass.

Today his route is over good roads, and indeed much of it is paved. But things were very different in 1920. One still crawled along on old-fashioned desert roads—roads which were merely mule-team tracks, slightly improved; winding one’s way through the sand, according as topography or vegetation had chanced to direct the first traveler to go that way. The all-important rule of the road was to keep in the wheel tracks of your predecessors. To leave these tracks might entail severe penalties, though this could not be avoided, in the rare event that two vehicles had to pass one another. At such times, one or both of the parties might have to spend a laborious quarter hour or so in getting out of the deep sand and back into the wheel tracks again, laying brush beneath their wheels, perhaps deflating their tires, or even partly unloading their cars.

In our case, the trip was made in a Ford “pick-up” of not very recent model, belonging to the Museum of Vertebrate Zoology of the University of California. It was a phenomenally thirsty little flivver, whose radiator required such frequent replenishment that a ten-gallon

can of water had to be carried on our runningboard. The car lacked a self-starter, and some other present-day "necessities," and our load was heavy. Also, I had not yet learned to drive. Opportunities for repair were conspicuous by their absence. Unless one were a fairly competent mechanic, he took some risks in embarking on such a journey. We spent three days on the way from Mojave to Death Valley.

Just after we had descended the Slate range into Panamint Valley, we heard an ominous snap somewhere in the anatomy of the old flivver. The front spring bolt had broken. Since this bolt played a vitally necessary role in holding the car together, we were naturally somewhat disturbed. But Grinnell fastened the parts together provisionally with bale wire, and we crept on cautiously to Ballarat, a few miles distant.

Ballarat is one of those ghost mining towns of our desert country, which had its "hell-roarin'" days some forty years ago, and then, true to form, lapsed into a forlorn collection of ruins. But we had hopes that there might be a few survivors haunting the premises, who could give us help in our trouble. We approached the settlement at about sundown. We could see a few tough-looking men lined up, watching our approach. Our car, by the way, bore the required legend, painted upon all cars belonging to the University of California: the name of the University, followed by the name of the department which employed the vehicle. In our case, "Museum of Vertebrate Zoology" had been rather too much for the painter, so only the initials were included.

One of the miners stepped forward, eyed our car and its label and spoke: "Department of M. V. Z.—What kind of a hell of a god-damn thing is that?" And derisive laughter followed from the others. Their greeting was decidedly disconcerting. Was this the kind of reception we had to face? However, the sequel was fortunate-

ly very different. After a brief parley, the boss of the gang invited us to make camp with them, and promised to have our car repaired. As I recall it, he would not accept any pay for this important help.

This crew had secured the privilege of working over the "tailings" of a formerly valuable silver mine, hoping to extract the residue of the metal by the use of more modern methods. The boss appeared to be a man of considerable education and almost poetic temperament, and he chatted with us at our campfire in the evening in a most companionable way. All this, as it happened, after a furious quarrel in which he had engaged with one of his crew a short time before, when the atmosphere was thick with profanity and vile epithets . . . "There's so much good in the worst of us," etc.

In the morning, Grinnell and I set out again for our destination, from which we were now separated only by the lofty Panamint Range. This had to be outflanked. The road we took led up Wild Rose Canyon. A most inappropriate name in this arid country, one might suppose, though it was actually justified by the facts, for springs of mountain water do support a growth of wild roses there. We had been warned that one of the infrequent cloudbursts of this region had demolished considerable sections of the road ahead of us some weeks before. But the road, in any case, merely followed the course of a dry wash, so we took the chance and went ahead. For some miles we really made our own road, picking our way along the bed of the wash and rolling large rocks aside at frequent intervals. The grade was so steep in places that more than once we had to unload the car and carry some of the boxes uphill by hand. It was a journey of a day and a half from Ballarat to Furnace Creek Ranch in Death Valley.

In a way, I suppose it represents "progress" that any motorist can now make the journey between these two

points in three or four hours, over a good road. But to me recent developments in Death Valley are altogether saddening. Death Valley is no mere natural curiosity. It is a place of tremendous scenic grandeur. Its outstanding characteristic is its aspect of appalling desolation. One would prefer to find there, as nearly as possible, the terrifying spectacle which confronted the pioneers a hundred years ago. Death Valley as a popular winter resort for tourists simply doesn't make sense. Yet the vandals have been allowed to erect a large modern hotel on a conspicuous elevation, overlooking the valley, and have provided endless miles of paved roads, over which the automobiles of the entire nation may spin quite heedlessly. There surely ought to be a few precious spots left in our country which are accessible only to those persons who are willing to make some effort to reach them. Only such will fully appreciate what they see. The thoughtless crowds altogether destroy the spell, and spell is of the very essence of places like Death Valley.

Accordingly, I recommend to the really appreciative visitor to Death Valley that he defer his visit till early summer, after the crowd has gone. That is, if he can stand the heat, for he will find high temperatures even in May.

Grinnell and I spent several weeks in the valley. He was collecting specimens of birds and small mammals for the "M.V.Z." and making the field notes, which are often quite as valuable as the specimens. I was trapping numerous living mice of several species. These were taken to La Jolla, and became the ancestors of "Death Valley" stocks which furnished important material for some of our later studies. In general, a cultivated area within a desert appears to be a particularly favorable place for trapping these small rodents.

Grinnell has recently passed from the picture: a friend whom I greatly miss. He was one of the first

who lent a sympathetic ear to my program for the study of geographic races of animals, and his advice and encouragement, to say nothing of substantial material help, were important elements throughout in making this project successful. Grinnell was a naturalist of a high order, and a field trip with him, such as this one to Death Valley, was an affair of great informative value. Despite whimsical differences of opinion regarding our camp routine, we never quarreled, and my recollections of our companionship during that somewhat trying trip are uniformly pleasant.

The only piece of ground under cultivation, in the Valley during our visit, was a forty-acre field of alfalfa, which was irrigated by water piped from the near-by Funeral Mountains. This land was owned by the Pacific Coast Borax Company, of "Twenty Mule Team" fame. It was known both as the "Furnace Creek Ranch" and the "Greenland Ranch," the latter name being bestowed in grim irony, since for years this spot held the world's record for high temperature: 134° Fahrenheit, under standard conditions. However, our visit was in March and April, and the temperature reached no such fantastic levels then. Indeed it was at times actually chilly.

In charge of the Furnace Creek Ranch was an interesting character, Oscar Denton by name, handsome, taciturn, and enigmatic. He was the son of an English army officer by a Spanish mother. Dane Coolidge, in his "Death Valley Prospectors," states that Denton had been obliged to leave Mexico some years earlier, in consequence of a shooting affair in which he had been concerned. He was very suspicious of strangers, and we should not have been allowed to camp on the ranch had not permission been obtained in advance from the officers of the Borax Company.

While we were in Death Valley, two representatives of the Hollywood movie colony arrived by air-

plane. News was promptly circulated in their home papers that these men had been lost in the desert, which was, I presume, just a familiar bit of Hollywood publicity stuff. They took some shots at us two naturalists at our labors, and then attempted to shoot a furious desert dust storm, which opportunely appeared on the scene and raged for a day or two. We never learned whether this film was shown on the screen. These men were the vanguard of an invasion of Death Valley by the moving picture world, which has found there, in recent years, suitable backgrounds for filming some of its Wild West romances.

Later in the course of my mouse trapping career, I extended my operations to a very different type of country from our arid southwest. During the summer of 1924, and again in 1927, I spent much time in northern Florida and southern Alabama, the first year alone, the second with an assistant. And interesting trips they were. The old South seems to be the only part of our country which has still retained much real local color. The visitor from the north cannot fail to be surprised and amused by the curious pronunciation of so many words and the quaint and unfamiliar expressions which he hears on every hand. One really has to stay long enough to master the language before he can fully understand what is said to him. Even the zoologist has a new vocabulary to learn. When, for example, a rural Southerner talks about a "gopher," he does not refer to the rodent which we call by that name. He is thinking of a burrowing land-tortoise. He is, to be sure, quite familiar with our gopher, but he calls that a "salamander!" And the animals which we were trapping were not commonly known as mice. In fact, we found people who did not know what the word mouse meant. Tiny as some of these creatures were, they were all "rats" to the Southern farmer—"little old field rats,"

in his quaint dialect. One may safely predict, however, that within another quarter century the automobile and radio, and the influx of settlers from other states, will have largely eliminated local color even from Dixieland.

When I was in Marianna, Florida, in 1927, with my assistant, John Karol, Florida's eminent realtor-evangelist, the Reverend Bob Jones, arrived in town and staged a revival meeting. Of course Karol and I had to attend the meeting, and of course we had to sit well forward, close to the pulpit. Bob was known to be a staunch fundamentalist, and we naturally took this opportunity to extend our knowledge regarding evolution. When he reached this part of his discourse, he told us a harrowing tale. Here it is, copied from my contemporary notes:

"I had been speaking at an evening meeting in Chicago," he said, "and was walking home to my hotel, when I noticed a man skulking along in the dark and appearing to follow me. Finally, before reaching the hotel, I turned to him, and asked him if he wanted to speak to me. 'Ah!' he exclaimed, 'I am not worthy to speak to you.' 'That's all right,' I said, 'Come into the hotel and let's talk it over.'

"The man told me an almost unbelievable story of sin and sorrow. 'I had graduated with honors from high-school,' he said, 'and my mother surprised me with the good news that she had saved enough to send me through college. When I first left home for college, I was as pure as any girl! But I soon fell into the hands of a professor of biology, who proceeded to destroy my faith. First he tore out the first chapter of the Bible, and then he tore out the last, and then all the chapters between just naturally fell out by themselves. And now,' he said, 'I am a ruined man. There isn't a commandment that I haven't broken. I am suffering from an unmentionable disease. And I've just had word from

my mother that she's coming down to Chicago to see me. What am I do do?" Unfortunately, the Reverend Bob passed on to another subject without disclosing the nature of his advice to this unhappy creature of his imagination.

Jones was a big impressive looking fellow of the "go-getter" type, who seemed to be well nourished, and thoroughly successful in his worldly affairs. He was at the time promoting a fundamentalist college near Panama City, Florida—named for himself—and alongside this a residence tract, offering "Homesites at reasonable rates." He certainly was "making the best of both worlds!"

Another experience in my mouse-catching career was very far indeed from being amusing at the time. I was collecting in the vicinity of Del Monte, California, and had scattered part of my traps—twenty or thirty of them, I believe—throughout a grove of live-oaks, adjoining an extended area of open pasture. In the afternoon, when I set the traps, there was no hint of impending trouble. But on the following morning, I arrived to face a somewhat alarming situation. As I approached on the highway, I could hear the threatening roar of two angry bulls. They were rampaging in the open field, adjoining my live oak grove, moaning menacingly and kicking up clouds of dust. To my dismay, the grove was not separated from the field by a fence. However, I decided to take chances. I kept to the highway, until I was well past the field, then crawled through the fence and entered the wood. As I gathered up my traps, I could hear the steady moaning of the bulls, and I soon began to realize that the sounds were getting nearer. I picked out a suitable tree, to serve as a refuge in emergency, and hastily rounded up as many traps as possible. Before long, the animals suddenly trotted into view at disconcertingly close quarters, and

I made the speedy ascent of my chosen oak. I perched some eight or ten feet above ground upon a large horizontal limb, while my pursuers stood below and snorted in baffled rage. Then I noticed for the first time that the horns of one of these beasts was decorated with the viscera of some animal which it had just gored to death. Who was it that piously remarked, as he watched a criminal being led to the gallows: "Save for God's grace, that man were I!"?

For a while, my foes did not seem disposed to leave me, and I began to prepare for a long siege. When finally they did so, I cautiously resumed the salvage of my traps, but I was treed a second time before the job was completed.

## CHAPTER XVII

### MAN VERSUS NATURE

It was during some of these collecting journeys in quest of *Peromyscus* that I discovered for myself the beauty and the majesty of the redwood forests of north-western California. And it was then that I first realized the ruthless waste of this great national scenic asset which is being wrought by the lumber industry. What are believed by many to be the most imposing, and are certainly some of the oldest forest trees on this continent are being sacrificed for the short-lived personal gain of individuals who have chanced to acquire a "legal" title to them. Here is rugged individualism at its ruggedest. I presume that to vast numbers of people, even now, there is nothing to criticize in a system which allows the chance purchaser of ten thousand acres of woodland to destroy a forest which could not be restored in a millenium. To me the stupidity and injustice of such a situation have been evident from the time that I began to reflect upon it.

Oh yes, it is true that much of this redwood lumber serves a "useful" purpose while it lasts, so that many of us besides the lumber kings derive a brief benefit from it. We build dwellings of redwood—I have one of my own. But the supply can last only a few decades more, while many of the trees are well over a thousand years old. When they are gone, people will have to use other kinds of building materials, and these they will probably have no difficulty in devising. In the meantime, the country will have suffered an irreparable loss. This despite the pitiful fragments of those matchless forests which the "Save-the-Redwoods League" has valiantly rescued for posterity.

It was in the course of these collecting trips, too, that I first really became acquainted with our deserts. And this acquaintance ripened into intimate friendship. A type of landscape which appeals to me more than any other is that which prevails in our arid Southwest: transmontane Southern California, Arizona and New Mexico. The naked ruggedness of the topographic features and their comparative freedom from human despoliation, the weirdly picturesque vegetation, the endless vistas, but little dimmed by the violet haze, and the ever-changing colors and shadows as sunset approaches, have an intense fascination for me. The somewhat anthropophobic slant of my mind doubtless has something to do with these preferences. One of the glorious features of the desert landscape is the relative scarcity of that hopelessly unesthetic creature, man. But, even here, he has begun to stream in over a maze of newly constructed automobile roads, and is busy broadcasting ugliness where once was beauty. For our population, to use a modern bromidism, is becoming "desert-minded." Alas, poor Desert!

It is largely my concern over the rapid effacement of our heritage of natural beauty which has been responsible for my interest in two movements of the day, those of conservation and of birth control. I am not so much disturbed over the reckless waste of our mineral resources, appalling though that is, least of all over the fact that future generations of sportsmen will have less "game" to shoot than now. The conservation which chiefly arouses my interest is the move to arrest, so far as possible, the despoliation of our landscape and the extermination of our native species of plants and animals.

Similarly, the aspect of birth control which appeals to me most is the desperate need of checking the multiplication of the human species before it fills every nook and cranny of the world which can be made habitable.

I agree most fervently with those who believe that the world as a whole is already greatly over-populated, and that important areas in our own country are far too densely crowded for their inhabitants to enjoy normal lives. Fortunately, special students of population trends in our country find reasons for believing that our period of numerical growth will end automatically before the close of the present century.

It is one of the inevitable tragedies of civilization that real solitudes are fast disappearing. Such areas as are open to exploitation by lumber, water-power and grazing interests are being rapidly robbed of their natural scenery, while our national parks are being subjected to another form of exploitation by concessionaries who conduct a nation-wide campaign of advertising, designed to attract the greatest possible number of tourists.

It is the deserts, or some portions of them at least, which seem likely to hold out longest against this universal assault of man against nature. And for that reason, the deserts are likely to become increasingly the haunts of naturalists, artists and others who are appalled by this mad race to suburbanize our entire continent. Fortunately, much of our desert land can probably never be irrigated, owing to its elevation and its distance from any feasible water supply. For to some of us these great waste areas are vastly more valuable as natural museums, or indeed as so much sheer landscape, than they ever would be as ranches, however well irrigated.

What, after all, is gained when we open up a new tract for settlement? A few more people provided with homes, a slight addition to our nation's food supply, that is all. Does anyone in his senses believe that we can go on indefinitely providing homes and food for a steadily growing population? The day is not far distant when our population, if not otherwise checked, would have to stop growing from mere lack of food and space to live

in. And the date of this momentous turning point in our civilization would be very slightly deferred if every acre of possibly habitable land were to be surrendered to home-seekers, and none reserved for recreational, esthetic or scientific purposes.

Holding such views, it is but natural that one of the writer's chief collateral interests for a number of years was the "effort to rescue a few fragments of vanishing nature." But what can be done about it? No sane person would be so foolish as to dream of arresting the advance of what we call civilization. The forests will continue to be felled, the remaining arable land will be cleared and tilled, and the cancer-like growth of our great cities will persist unabated for a long time to come. Can we do more than repeat the idle gesture of the legendary King Knut as he stood on the sea beach and bid the waves recede? At one time I was sanguine enough to believe that we could. I even fancied that I should be able to make some personal contributions to the cause. And so I wrote a few eloquent blasts for publication, and served as a member or an officer in several organizations devoted to "conservation." For a while, I entered into the good work with all the zeal of a crusader, and throughout several years I gave a really considerable amount of time to these endeavors. I even helped to found one such organization in our local community.

These experiences taught me why such movements are so largely futile. It is for the same reason that movements to reform the governments of our great cities are so largely futile. The "reformers" are amateurs. Their opponents are professionals. How can a few zoologists, botanists and nature-lovers, innocent of the game of politics, make any headway against such eminently practical people as lumbermen, real-estate promoters, cattle and sheep raisers, water-power magnates, sportsmen and

ammunition dealers—groups united in the common enterprise of destroying our wild life and our scenic beauty?

Then, too, unless the conservationist happens to be wealthy, his efforts in this direction must be restricted to odd hours. He can write heart-rending appeals to the papers, or letters to persons in authority; he can frame impressive resolutions to be passed by the organizations to which he belongs. But there the matter usually rests. The absolutely essential "follow-up" activities—the solicitation of letters and telegrams from sympathizers, the interviews with men in key positions, the attendance at legislative committee meetings—these our conservationist rarely has the time or the personal qualifications to undertake. Our "practical" man, on the other hand, with his financial interests at stake, has both the time and the qualifications. Or he employs someone who has.

Meanwhile, the greater part of our population—here again, we may make comparisons with reform movements in our cities—belongs to neither camp. The mass of the people are indifferent, and see no serious need for improvement; those who are not indifferent have settled down into a state of hopeless resignation. The nature-loving conservationist can rarely appeal to an aroused citizenry, since the citizenry is rarely capable of being aroused in this direction. The public, for the most part, is crassly utilitarian, and argues that the world was given to man to use (he generally means to *use up*). How often do we hear a tourist, in the gloriously picturesque arid lands of our Southwest, lament the fact that all this waste land cannot be irrigated! To most persons the desirability of such an achievement seems axiomatic. To doubt this would be to betray an unsound mind.

Another axiom of the "practical" man's philosophy is that any animal that stands in the way of any human interest must be sacrificed, even to the point of extermination. The coyote and the prairie dog interfere at

times with the operations of the stock raiser. And so our government has spent vast sums upon the destruction of these two romantic figures of our Far West. There is no need of this, even from a strictly economic standpoint. The indiscriminate extermination of the coyote, indeed, is removing a predator which formerly kept our rodent pests under control.

Every visitor to our Southwest knows that strange, long-tailed, handsomely colored bird, the "road-runner," a giant, nearly flightless cuckoo, which scurries along our highways and at times narrowly escapes being run over. The road-runner eats lizards and insects, but also occasionally the eggs and young of other birds. Cases have now and then been reported of its devouring the eggs of the quail. Is it surprising that our "sportsmen" have shown grave concern? What if these two birds have been dwelling side by side since the far-off days when the Rancho La Brea asphalt pits were formed! Man can brook no competition in his career of extermination. The road-runner is at present "protected" by law, it is true, but what is the law between a sportsman and a compliant game warden?

A few years ago, a group of aerial freebooters in the Sacramento Valley startled us with the announcement that they had inaugurated a grand new sport, the hunting of eagles from airplanes. One of these supermen claimed a record of one hundred and sixty of these birds in a few months. If his claim were true, he must have destroyed an appreciable fraction of the total number of eagles in this part of California. Inquiry revealed the probability that many or most of the birds killed by these men were the American or "bald" eagle—our national emblem!\* This bird, too, is "protected," whatever that may mean. It is reliably stated that the bald eagle, unlike its relative the golden eagle, is primarily a carrion

\* F. H. Dale, in the "Condor," September-October, 1936.

feeder and not a predator at all. Whether any arrests were made, following these publicly boasted violations of law, I have not learned.

The massive, noisy sea lion of our California coast occasionally becomes enmeshed in the fishermen's nets. It is possible that at times it does real damage there. Despite the clamor of fishermen, this animal has so far remained on the "protected" list. But night and day, we have heard gunshots from near-by fishing boats, at times when sea lions were seen in the neighborhood while the bodies of these animals, more than once with visible bullet wounds, have been frequently found upon our local beaches.

Again, the great white pelican of our lakes eats some of the fish which our sportsmen would like to carry home in their baskets. As a result . . . . but why multiply instances further?

There are equally powerful forces busy with the desecration of our landscapes. The automobile has almost banished the wilderness from our continent. A magnificent achievement, many will say. Think of the vastly greater number of people who can now enjoy nature! There is doubtless much to be said for this contention. But there are other aspects of the situation which are generally overlooked. The motorist, with his discarded match or cigarette stump, is responsible for a considerable proportion of the forest fires, which are ravaging one after another of our wooded mountain slopes, and bid fair to degrade our mountains everywhere to the status of "bald hills."

And the motorist is also responsible for the lamentably unesthetic highways which now traverse so many of our rural regions. To the average motorist, it would seem, a highway is merely a means of getting from one point to another with the greatest possible speed. And our road engineers are busy providing him with such high-

ways as fast as public funds permit. Every curve must be eliminated, even at the cost of cutting an endless series of unsightly canyons through our hills. Too often we speed on through deep cuts and over high embankments, with all the monotony of a railway journey.

However, a sinister new figure has appeared upon the scene, which seems likely to dwarf the automobile into insignificance as an agent for "taming the wilderness." What will happen to our landscapes when every square mile of level ground has its landing-field for airplanes we can only imagine. The plane may prove to be as destructive to our own scenery and wild life as it has been to the cities of our enemies.

As things now stand, it would need the timely intervention of a dictator to avert the extermination of many of our most interesting animals and plants, and the nation-wide despoliation of our landscape. For the processes involved are largely irreversible. The losses involved are permanent ones. It would require a geological epoch to heal some of the worst scars which man has already inflicted upon the face of the earth, while an infinite future will never restore a single lost species. The forces of destruction are at present increasingly active, and they meet with but slight effective opposition. *Education?*—Pardon my somewhat derisive smile.

The difficulties to be encountered in winning even a relatively insignificant victory in this field were brought home forcibly to some of us in the course of a struggle which was waged in our local community a few years ago. This had to do with the rerouting of one of our major highways from San Diego to the north. The real-estate promoters and their allies favored for some reason a route which was not only impracticable, according to the best expert opinion, but which would have inflicted serious damage upon one of our chief local scenic attractions. With few exceptions, the "esthetic" and "cultural"

elements of the community were opposed — many, indeed, belligerently opposed—to this solution of the problem.

An active organization was formed for the express purpose of thwarting this outrage. It conducted an efficient campaign, extending through many months. A number of friends of conservation gave up a large part of their time to these endeavors throughout this entire period. Letters by the score were written to the local press, meetings were held at frequent intervals, public men were interviewed, petitions were sent to various official bodies concerned, and finally court action was resorted to. Local feeling ran high, motives were impugned, and enmities were aroused which persisted for years afterwards.

After all this to-do, the best that we could achieve was a compromise. The plan of the "realtors" was defeated, to be sure, but so also was the alternative endorsed by their opponents. A third route was adopted, not nearly as bad as that which had precipitated the struggle, but very far from satisfactory. This experience is probably not in the least unique. I presume that it could be paralleled in many of our large communities throughout the country.

This chapter, as a whole, may sound like the forlorn wail of a hopeless defeatist. I must admit that the world outlook, from a nature lover's point of view, does seem rather desperate at present. Perhaps I have not given sufficient credit to the activities of a number of organizations, scientific and civic, which have long maintained an alert attitude toward these assaults of man upon nature, and have occasionally succeeded in thwarting some of the worst of them. Possibly we have a right to hope that one of the postwar reactions from our present orgy of universal destruction may be a more serious move to save something of what remains to us. In how far es-

thetic and naturalistic considerations will be able to assert their claims at that time remains to be seen. The outlook would seem to favor the continued dominance of the "practical" man, but we trust that this dominance will not be conceded without a struggle. For I suspect that the "practical" man, in the present case, is the same greedy individual who has been asking for special privileges ever since the day of his birth, the same one, too, who brands as a "communist" anyone who stands in his way. The results of the election of November, 1944, encourage one to believe that this particular red herring has lost some of its effectiveness with the public.

## CHAPTER XVIII

### WHY IS A MOUSE?

Perhaps I have created the impression that the scientific aspects of my work were of secondary interest to me during this period of my life. If that impression has been given, it is merely because scientific researches are rarely conducted on a very high emotional plane. However great the energy expended, the current involved is commonly one of low voltage. The results themselves are seldom spectacular—to the layman they are seldom even interesting—while the steps by which these results are reached consist very largely of dull routine. I am sure that it would not prove entertaining to anyone were I to report in detail my activities during those seventeen years or more when I was occupying myself with deer-mice. It may be instructive, however, to preface my account of the *Peromyscus* program with a sketch of what this program meant in terms of my daily life.

I have endeavored to give the reader a glimpse into that precious fraction of my time which was devoted to collecting trips. In so doing, I said nothing of the methods which had to be worked out for trapping the animals, maintaining them in health in the field, and ultimately shipping them back to La Jolla. We shall have to take all that for granted.

The bulk of my time at the Institution was divided between the laboratory and the mouse-house—the “murarium” as we called it when we wished to be impressive. At the latter place, I kept and reared living mice, in numbers ranging from a few hundred to a maximum of fifteen hundred at a time. These comprised in part specimens collected on my field trips; more largely, the nu-

merous descendants of these. The mere daily care of these animals required from one to four or five hours daily. Fortunately, this drudgery, at most times, could be performed by an assistant.

However, much of the work could not be delegated to assistants, however competent. Matings of a definite nature had to be made at definite times, and records kept of the resulting broods. When old enough, every young mouse had to be given a serial identification mark, according to a definite code. One who engages in breeding experiments with animals must resign himself to voluntary servitude. His movements are determined, not by his own convenience, but by the reproductive and growth processes of his stock. Thus whenever, by reason of age, a given lot of mice "came due" for killing, they had to be transferred to the laboratory for measuring and skinning. The job had to be performed, moreover, within a few days at most of the time indicated.

Work in the laboratory consisted chiefly of skinning, measuring and computing. Measurements were made by the tens of thousands—measurements of length, area, weight, color; measurements of the entire body and of various parts of this. After the measurements came the computations. Weeks at a time were devoted to these, in the aggregate perhaps years. Now and then, at the close of a series of computations, one or two highly significant figures emerged, figures which proved some point of importance. These represented the distilled essence of months of waiting and hundreds of hours of work. Such occasional gleams of light are all that justify the uninspiring toil which leads up to them. They are the stuff out of which scientific discoveries are built.

There are scientists, I believe, who restrict themselves to utilizing these luminous end-products of laboratory routine, leaving all the preliminary drudgery to assistants. So far as this may be feasible, it is doubt-

less a vastly more effective procedure, at least from the standpoint of quantity production. But there are things to be said on the other side. In my own work, I have insisted on making nearly all the measurements and color readings myself. This is partly because no assistant can be expected to take the same interest in maintaining accuracy as the man primarily concerned, but more important yet, because of the necessity of uniform procedure. Unlike the physicist and the chemist, the biologist deals largely with objects which are not especially susceptible of precise measurement. The "personal equation" is likely to be far greater. For strictly comparable results, it is necessary that the same individual should make all the observations throughout. In general, I prefer to be that individual, though on occasions I have had "check" series run by a collaborator. However, I have throughout these studies profited in important ways from the work of assistants. I must acknowledge, in particular, the valuable help of Henry Homer Collins and Ralph R. Huestis, both of whom contributed materially to the success of the program, including their share in some of our announced discoveries.

There is a still more fundamental reason, I believe, why every scientific investigator should do part, at least, of his own routine work. This is in order that he may have a more vivid realization of what his data represent. A set of figures delivered to one upon a slip of paper do not have the same meaning — certainly not nearly as *much* meaning — as if one had personally had a hand in extracting them. The figures are merely abstractions, divested of much that may be quite relevant to the problem before one. I should certainly mistrust the work of a biologist who restricted himself to second-hand information of this sort.

With a view to evaluating the scientific results of my long abandoned *Peromyscus* project, I have re-read,

before recording these impressions, the hundred-page review of all these studies which I wrote at the time of their discontinuance. In re-reading one of my own literary productions, after a considerable interval, I am nearly always subject to a curious illusion. The thing seems so much better than anything that I could do now. I must have steadily declined in mental powers, not only during my advanced years but throughout most of my life! Accordingly, I now find this bulky review unexpectedly well-organized and well-written. Better yet, it seems to contain much of value both in the realm of fact and of theoretical discussion. Furthermore, I venture to think that these merits are not entirely illusory. In any case, the paper brought me numerous compliments, and it has been cited rather freely by other writers in related fields. However, I think that I hold no exaggerated idea of the importance of this work. There was, throughout it all, nothing very new in principle, either in the methods followed or the results obtained. There was nothing comparable, in novelty or importance, with numerous other advances in our knowledge of heredity and evolution which might be cited since the year 1900.

I had dealt throughout with the "subspecies" or "geographic races" of this group of wild mice. As is well known to zoologists, many species of birds and mammals which inhabit extensive territories exhibit considerable differences in different parts of their ranges. They may differ in respect to nearly every characteristic: in total size, proportionate size of certain body parts, color and various other features. These geographic races look so unlike, at times, that persons unfamiliar with the situation are likely to insist that they ought to be listed as distinct species. So indeed they ought, but for two circumstances: first, the gap between even the most unlike of these races is bridged by a continuous series of intergrading forms; and second, so far as has been tested,

there is no lack of fertility between the most extreme of these races, as is more commonly the case with "true" species. The species with which I had most to do, *Peromyscus maniculatus*, ranges from the Atlantic coast to the Pacific coast of this continent, and from the Arctic regions to Central America. Within the state of California alone, we have races which vary in shade from buff to chocolate, and which have tails differing in mean length by as much as twenty five per cent.

To the zoologist, particularly one who is interested in the broader problems of evolution and animal distribution, the existence of these geographic races offers a serious challenge. I shall refer here to only a few of the problems which it raises.

In the first place, what do these races mean from the standpoint of evolution? Are they not merely the earlier steps in the origin of species?

But hold! There is another question to be settled first. Perhaps the differences between our races are not hereditary at all. These races in all cases occupy different territories, often ones with considerable differences of climate. Perhaps their peculiarities are merely the direct result of climatic influence upon each individual, and would disappear in the first generation, if the animals were transplanted at birth to another climate.

If it is found that the differences are really hereditary, a third question arises relating to their origin. Are these racial peculiarities useful to their possessors, and therefore the probable results of the operation of natural selection upon ordinary plus and minus variations; or are they the results of the prolonged action of climatic differences, which have been accumulated throughout great numbers of generations? We could not, of course, accept the latter alternative unless we were prepared to admit the reality of the "inheritance of acquired characters." I have always been prepared to make this admission if the facts seemed to require it.

A fourth question is a more technical one. Do these differences between geographic races depend upon Mendelian units or "genes," which retain their identity, despite all appearances to the contrary, when two different races are crossed? Or are the laws of Mendel things which have no application to "natural" species and subspecies? The question is doubtless technical, but the answer is of great importance to biological theory.

I think that our *Peromyscus* studies have thrown some light upon all of these questions. Indeed, in one case, they furnished an answer which was definite and conclusive.

Let us leave to the end the first of the foregoing questions, and consider the second one first. Are the distinguishing characters of these local races fixed by heredity, or are they merely transitory modifications which change according to the locality where the animal is reared? The procedure to be followed in answering this question was obvious. One merely had to raise animals of several different subspecies, side by side, in the same environment. Strange to say, no one appears to have made a scientific test of this question, prior to our experiments with *Peromyscus*. A majority of the special students of birds and mammals believed, to be sure, that these various subspecies would "breed true" in any environment. But they did not know, and there remained a minority who contended that the contrary was probable.

Our test of this question, as nearly always happens, encountered practical difficulties which a beginner would not have forecast, and it involved an unexpectedly large expenditure of time and money. But the answer was clear: three quite distinct geographic races of one species of *Peromyscus* gave no evidence of increasing resemblance to one another, when they were reared together at La Jolla for several (four to twelve) generations. This conclusion is based upon measurements both of color and

of bodily proportions. Confirmation was later obtained from two other species which were tested for color characters only.

Thus, whatever their origin, the distinguishing features of these races has become sufficiently fixed in their inheritance to persist for at least several generations, after the animals were transferred to a very different environment. This result admittedly did not make it certain that no visible alterations would have been brought about had the experiment been continued much longer—say for several centuries, instead of eight years.

The next question, accordingly, related to the probable origin of these racial differences. Is it likely that they had resulted from the direct action of the environment, continued through many generations, or had they been evolved, as adaptations to this environment, through the survival of the best fitted chance variations?

From the nature of the case, it was hardly possible to settle this question experimentally. But considerable circumstantial evidence was found, and this, on some points, was decisive.

Naturalists have long been impressed by relations which seem to hold between some of the peculiarities of these local races and certain features of their environment. The most conspicuous of these relations concerns color. A definite correlation between pigmentation and atmospheric humidity or rainfall has long been recognized. The pale tints of the desert fauna in general are familiar to many besides naturalists. This pallor relates to many species of animals belonging to several different major groups. Less familiar, though of undoubted reality, is the dark hue of the birds and mammals of rainy or foggy regions, such as the coast belt of our Pacific Northwest. One enthusiastic European ornithologist is on record as saying that he could estimate fairly well the mean annual rainfall of a given locality if he had at hand

a specimen of a certain species of bird from the locality in question!

Some reasons may be offered for believing that humidity as such is the factor of the environment which is directly responsible for this relation. At one time, I myself urged the probability of this interpretation of these facts, though I never questioned the reality of protective coloration in general. It has been argued by some that the presence of abundant moisture in the air or in the soil is favorable to the formation of dark pigment in the organism, while, contrariwise, aridity tends to inhibit its formation. There may be some basis for this belief, though I have been unable to produce any changes by this means experimentally.

Contrary to my earlier belief, I am now fully convinced that rainfall and atmospheric humidity are chiefly operative indirectly, through their influence on the color-tones of the soil. The largely uncovered soil of the desert is conspicuously pale; the humus-laden soil of the coastal belt is prevailingly dark. In each case, we may believe that the more conspicuous individuals have been subjected to a higher rate of elimination by predators.

Fortunately, there are critical cases, in which the effects of humidity or aridity may be ruled out of consideration altogether. Races of pale mice, dwelling on isolated sandy beaches, close to the ocean, have been known for many years. The most extreme case of this sort known to me is an extraordinarily bleached mouse, which inhabits an island of white quartz sand skirting the Florida coast. Here visible pigmentation is confined to the animal's eyes, and to a very pale gray area of hair, extending along the middle of the back. The remainder of the hair and skin is totally white. All this in a region of high rainfall and high atmospheric humidity.

Far inland, in a region of dark, agricultural soil, dwells a normally colored race of the same species, which

resembles the island race rather closely in every respect except color; while on the sandy coastal area of the mainland dwells an intermediate race, very pale, though considerably darker than that of the island. This and the inland race intergrade some miles from the shore.

For the sake of good measure, I will throw in another case, that of two species of mice belonging to a quite different family, found in neighboring areas of a desert in New Mexico, where both rainfall and atmospheric humidity are very low. One of these species, inhabiting a tract of white gypsum, is amazingly white; the other inhabiting a black lava-flow, is nearly jet black.\*

Such evidence—and there is much more of it—convinced me that the result which Nature has aimed at, so to speak, has been the concealment of these animals from predators seeking to devour them. This is a time-honored view, older doubtless than Darwin. A few years ago, it was regarded as an evidence of modernity to scout the theory of protective coloration altogether. But a wholesome reaction has set in, and it is likely that few zoologists now carry their skepticism so far as to repudiate the plain testimony of their senses and deny propositions which seem at present almost self-evident. Those not acquainted with the evidence will do well to consult Hugh B. Cott's valuable and readable recent book, "Adaptive Coloration in Animals."

Since my original belief in the direct agency of physical factors in evolution had become so greatly weakened, I shifted my chief attention from the role of the environment in the origin of racial characters to a consideration of how these characters are inherited.

This brings us to our fourth question: Do these differences between our geographic races depend upon Mendelian genes, which retain their identity, when indi-

\* These facts we owe to the studies of L. R. Dice and S. B. Benson. I have never visited this locality, but have seen specimens of the animals.

viduals of two races are crossed, or are the laws of Mendel inapplicable to the characters which distinguish races or species from one another? For a long time I was rather firmly convinced of the truth of the second of these alternatives. Later, largely as a result of our own experiments with *Peromyscus*, I was led to accept the former. To a layman, this question may seem to be an altogether academic one. In reality it is a fundamental one for biological theory. It is the question whether the transmission of characters from one generation to another follows a single, essentially simple pattern, or whether, in addition to this there are quite different methods of transmission, concerning which as yet we know very little.

In respect to inheritance, there would seem to be two very different classes of characters. Both of these were encountered in our breeding experiments with *Peromyscus*. In the first place, we had freaks, or aberrations from the normal condition, such as albinos and hairless mice. The peculiarities of these were found to conform quite plainly to Mendel's laws. They were transmitted to any single descendant completely or not at all; there was no blending in a cross with a normal animal; they appeared in simple predictable proportions after various types of matings.

On the other hand, were the "normal" or "natural" features which distinguished races or species from one another. These clearly blended when two races or species were crossed. It was not possible to recover individuals which closely resembled the original parents when their hybrids were bred among themselves. Such characters, to all appearances, were not inherited in alternative fashion at all. They could be forced into the Mendelian scheme only by adopting a supplementary theory which at first seemed to me extremely far-fetched. This is the theory that such characters as seem to blend and remain

blended, following a cross, are the expression not of single, but of large numbers of hereditary units. These units, it was held, segregate independently of one another, when the germ cells are formed, and enter into all manner of combinations, according to the laws of chance. Thus the majority of descendants of such a cross would continue to be intermediates, and the chance of recovering one of the original types would ordinarily be very small.

For some years, many of my facts did not seem to fit into the Mendelian scheme, and I took sides with those who contended that we were dealing with two very different classes of phenomena. In so doing, I clung to a position which was being rapidly abandoned by the dominant school of geneticists. Later, additional evidence forced me to adopt the majority viewpoint. Races which I obtained in Florida and Alabama gave rise to hybrids whose descendants were found to include a small proportion of specimens closely resembling the parent types. On the other hand, there were some "mutant" forms which appeared in our cultures, having peculiarities which were not transmitted in simple alternative fashion, and which were consequently believed to depend upon a number of different genes. Thus the gap between racial and "mutational" characters was diminished on both sides.

In theory, scientific men are influenced entirely by evidence, never by irrelevant circumstances or emotional bias. There may be scientists who are entirely disinterested and objective in their intellectual operations. I freely grant that I do not belong to that class. Since this is primarily a personal narrative, it may be allowable for me to make mention of the mental background which was partly responsible for my persistent rejection of the prevailing viewpoint regarding this problem that I have been discussing.

From the time that I was first able to think about such matters at all, I have always been repelled by "particulate" theories in explanation of natural phenomena. I refer, of course, to theories which seek the explanation of visible events in units far beyond the range of vision; theories which account for what we see by assuming the existence of ultramicroscopic particles, endowed with just those properties necessary to bring about the visible results. During much of my life, the molecular and atomic theories of chemistry and physics were repugnant to me when taken in any but a purely symbolic sense for pragmatic purposes. The more recent resolution of these atoms into infinitely smaller electrons and other bodies, arranged according to supposedly known configurations, and moving with definitely assignable velocities, has been vastly more repugnant to me.

And so when the *Drosophila* group of geneticists came along with their strings of ultramicroscopic genes, lined up in a definite order in the chromosomes, and designated by a series of whimsical names, I was naturally very far indeed from being sympathetic. The reader scarcely needs to be reminded that no one has ever yet seen a gene, and that the linear arrangements in question are purely conceptual affairs, deduced from indirect lines of evidence. We are offered for our acceptance complex patterns of invisible units, revealed only through their assumed effects in determining certain numerical relations among the descendents of a given pair of animals.\*

To formulate such a hypothesis requires a high degree of imagination; even to accept it without overwhelming evidence requires more than I possess. For some years I was disposed to regard much of this alleged genic architecture as belonging to the field of psy-

\* Possibly recent studies of the "salivary chromosomes" may necessitate some qualification of these statements.

chology rather than to that of genetics. And I still have no doubt that there has been a considerable admixture of wanton speculation in some cases. Nevertheless, I have come to regard the linear arrangement of genes as being as nearly an established fact as most of the other accepted generalizations in biology. Whether or not it represents an altogether adequate account of the mechanism of heredity is quite another matter.

Let me mention another personal trait which retarded my acceptance of the "new" genetics, namely, my emphatically nongregarious habit of mind. My initial feeling of aversion to the earlier speculations of the Mendelians was greatly intensified by the rapidity with which this movement took on all the earmarks of a fad—or rather, I should say, of a cult—with its somewhat fantastic terminology and symbolism, and its seemingly esoteric mode of utterance. I watched rather scornfully the helter-skelter desertion of other fields of biological endeavor, and the scramble to discover and name new "genes" and to arrange these in their presumed order on the chromosomes. My own repugnance to the band-wagon frame of mind in science has been so strong that I have sometimes leaned altogether too far in the opposite direction. This has more than once retarded my acceptance of an important discovery which had mischanced to become the starting point of a scientific fad.

We come back to the last of our questions (actually the first on our list): What do these races mean from the standpoint of evolution? I have some definite views on the subject which I have expounded in various published papers in the past. But these papers were addressed to audiences of specialists. I am afraid that any such disquisition, abridged for this occasion, would prove to be soporific to the lay reader (if any!) of these memoirs, while to a fellow biologist it would be merely a collection of platitudes.

I might say, for example, that our results point definitely to the origin of our geographic races through the accumulation of numerous small differences of the same sort as distinguish one individual of a race from another, rather than through single large steps; less certainly I could say that full-fledged species (or some of them) have come into being through the same sort of processes as have been responsible for the differentiation of our geographic races. I could repeat from the preceding pages that for color characters at least, this accumulation has very probably been the result of natural selection, acting in the direction of concealment, rather than the result of any more direct effect of the environment. I could add that such racial characters as relate to bodily proportions, length of appendages, etc., have no discoverable adaptive value, though they may be merely the visible manifestations of more deep-seated physiological differences which do have adaptive value. I could talk too, of the importance of isolation, population-pressure, etc., in the formation of these races. All these things may be true and important, so far as they go, but they do not get us very far.

Of a certainty, we still know very little about the process of evolution in its details, however sure we may be (and have a right to be!) of its actuality. With all our faith in the "survival of the fittest," we are rarely able to point out the particular elements of "fitness" that have enabled a particular type to survive. Nor do we know precisely the hazards which they survive. Why, for example, is one species of *Peromyscus* restricted to three of our southeastern states, while another is so widely distributed that "it is probable that a line, or several lines, could be drawn from Labrador to Alaska and thence to southern Mexico throughout which not a single square mile is not inhabited by some form of this species" (Osgood)? Why are some species or races restricted to

woodland, others to open country, others to bare rocks, etc.? Because they are specially "adapted" to these various habitats, we say. Of course, but has anyone taken the trouble to find out what this "adaptedness" consists in? Presumably we shall be able, in time, to answer some of these questions, but until then much of our discussion of adaption must remain airy speculation.

And now—exit *Peromyscus!*

Since it is probably my work in this field, more than any other single achievement, which has brought me such recognition as I have received from my scientific colleagues, a few words regarding these tokens of recognition seem fitting at this point. Indeed I should seem lacking in appreciation of these honors if I failed to mention them in a biographical narrative such as this. During the decade past, I was elected successively to the Philadelphia Academy of Sciences, the National Academy of Sciences and the American Philosophical Society. Shortly thereafter, I was chosen one of the vice-presidents of the American Association for the Advancement of Science (Chairman of Section F). That these are all coveted distinctions I think I may say without being boastful. My receipt of these honors surprised me and I doubt not many others.

My election to the National Academy of Sciences was particularly unexpected. Not that I ever accepted seriously the evaluation of one prominent member of that organization who contended facetiously that election to our National Academy was four times as much of an honor as election to the Royal Society of London! His argument was that with half the number of persons available to choose from, as compared with the National Academy, the Royal Society had twice as many members. I am not at all sure of the soundness of the arithmetic here involved, and in any case, I have always taken this claim as a joke, which it was doubtless in-

tended to be. Whatever the magnitude of this honor may be, I could (and still can) think of numerous persons not yet admitted to that body who seem to me better entitled than I to such preferment. (Kindly refrain from attributing this last statement of mine to "modesty," a virtue—if it is one—of which I have no great stock.)

## CHAPTER XIX

### FISHES OF THE SEA—AND SOME OTHERS

Fortunately the word "oceanography" has been interpreted in a very liberal sense by both of Ritter's successors, T. Wayland Vaughan and Harald Sverdrup. The scientific study of the ocean (which should, of course, have been called "oceanology") naturally takes account of the ocean's leading citizens, the fishes. Thus, the various problems of fish physiology in which I became interested were accepted as relevant to the activities of our oceanographic station. Indeed, when it turned out that marine fishes were not well adapted to some of these lines of investigations, fresh-water ones were substituted with the full approval of the director. And so it came about that "guppies" and "mosquito-fish" played, for some years, a rather conspicuous part in the doings of the Scripps Institution of Oceanography!

This shift in the scope of my scientific researches from mice to fishes by no means led me into a field which was wholly new to me. It was the fishes which had furnished material for my doctor's thesis and for some of my principal other biological activities prior to the *Peromyscus* adventure. I have already discussed my experiments with flatfishes at Naples in 1910.

During most of my working life, I have been greatly interested in problems of organic adaptation, and among these the significance of animal coloration has always held a prominent place. When I analyzed the differences among the geographic races of mammals, the color characters naturally received prominent consideration. Underlying all these laborious measurements and computations of hair coloration, was the problem of the

significance of this in the life of the animals. What produced these differences of color, and what, if anything, is their present functional value?

And so, when the fates led me back once more to the fishes as my own special group of animals, the problems of coloration retained their position in the center of the field. With respect to adaptive coloration, the fishes have, in fact, one great advantage over the mammals. This is their ability to change their color schemes in conformity with the requirements of the situation—not in the course of generations, but within a few days or hours, or even minutes. All this requires the possession of an elaborate physiological mechanism. And since this mechanism has been evolved independently in several different branches of the animal kingdom, we may presume that it is a matter of high value to the animals concerned.

Much less familiar than these rapidly reversible color changes, which do not involve any increase or decrease in the amount of pigment present, are changes which are brought about more gradually by the continued influence of a particular background. Changes of this class may involve large-scale changes in the actual amount of pigment in the tissues of the animal. It is with these quantitative color changes in fishes that we have had most to do at the Scripps Institution. In this work, Denis L. Fox, Peter Doudoroff and I have collaborated most advantageously. Much of our time for a number of years was devoted to the task of measuring these pigments, black, white and yellow, in fishes which had been subjected to various visual environments. Here our technique has necessarily been chemical, though the purely chemical problems involved have received minor consideration. My own limited knowledge of chemistry, particularly of biochemistry, has made such restrictions unavoidable, though some of the problems now perforce overlooked, will probably receive considerable attention from others in the future.

In themselves, these phenomena of color change might seem to have a quite limited biological importance, ranking with those various other curiosities of the living world which provide entertainment for the dilettante in science. But considered as highly complex adaptations, evolved in response to vital needs, they take on added interest. They become merged in the general problem of organic adaptation, which many regard as the central as well as the most baffling problem of biology. In the present instance, even the "need" which this function fulfils—the value to the animal of the power to change its color—has been a matter of dispute. As I have already mentioned, the time-honored explanation of concealing coloration as a protective adaptation has been boldly challenged in some quarters. There are those who shy at any explanation of organic phenomena which is not couched in physical or chemical terms. Such persons brand as "teleological" or "anthropomorphic" the notion that the interrelations among living organisms in nature may be as important influences in directing evolution as are the needs of adjustment to the physical environment.

Accordingly, it seemed worth while, among other things, to put to an experimental test this question of the utility of the power of color change in fishes. This I was able to do, thanks largely to the cooperation of the San Diego Zoological Gardens. Experiments conducted at our local "zoo" with two sorts of fish-eating birds showed conclusively that "mosquito-fishes" which had been allowed to adjust their color-tones to their surroundings for some time had a much greater chance to escape than those not so privileged. Equally striking results were obtained when larger fishes, instead of birds, were employed as predators. The ability of fishes to conform their colors to those of the background thus appears to be of undoubted value in the struggle for existence.

Curiously enough, no one seems to have previously attempted, on a serious scale, such an experiment with color-changing animals, just as no one had tested the question whether the racial distinctions among mammals were inherited. In neither case can I claim any great ingenuity for my technique. The main line of procedure to be followed was nearly as obvious as the need for the experiments themselves. All that I can claim credit for, in either instance, is the initiative to put the matter to a test, where others had been content to argue about it. In both cases the facts, as shown by experiment, turned out exactly as the great majority of competent judges would have predicted. But in the absence of evidence, any such predictions were nothing more than plausible conjectures.

Studies in our laboratory of the physiology of fishes came to include measurements of the metabolic rate (oxygen consumption), particularly as this is affected by temperature. Directly or indirectly, we measured the metabolic rate of fishes of several species, under a wide variety of conditions. Here again, we became concerned with the subject of adaptation, and made tests of the increasing tolerance of our animals to temperatures which, at the outset, were fatal to them. As so often happens, we emerged with an interesting array of facts, duly arranged and classified, but with slight clues to their meaning. Why, for example, a brief exposure to high temperature renders a fish more resistant to heat, even after the lapse of many days, we still have little idea. But some important problems were more clearly defined for post-war investigation. Engaged in these studies were two of our graduate students, Nelson Wells and Peter Doudoroff, who found in this field of physiology the subjects for their doctors' theses, and both of whom made contributions of considerable importance.

Later, these laboratory studies led me once more into the Great Open Spaces. Along with Marston Sargent in 1939, and with Urless Lanham, two years later, I visited some of the warm springs of Nevada and eastern California. Our wives accompanied those of us who were married. Incidentally, he it said that wives may contribute importantly to the success of a scientific expedition. If you have the right kind of a wife, take her along! But she must be the *right kind*. On the second of these trips to Nevada, snow storms added to the difficulty of oxygen titration in our open-air laboratory. My wife would doubtless comment that her kitchen was likewise open to the sky!

Our most interesting results came from comparisons of the metabolic rates of closely related races of fishes, inhabiting springs which differed widely in temperature. In one spring, for example, the fishes were living at the temperature of human blood, while thirty miles away were near relatives, living in ordinary cool water. The warm-water fishes consumed nearly twice as much oxygen per unit of body weight (when fishes of the same size were compared), as those living in the cool spring, but only so long as the natural temperature differences were maintained. Our experiments involved transfer in both directions.

In eastern Nevada, we dwelt for some weeks in the vicinity of two Mormon settlements, Preston and Lund. The latter, I presume, was named by Swedes, who are said to have been prominent among the early converts of the church. Our contacts with the people commonly called "Mormons" (they call themselves "Latter Day Saints") were almost uniformly pleasant, and we have every reason to credit these people with their share of admirable human traits. In Preston, we found them good neighbors in every sense of the word, extending us help and hospitality, wholly unexpected from almost total

strangers. It is not often, for instance, that one encounters a postmistress who will offer to lend money to a short-time acquaintance whose expected money order has failed to arrive promptly. Then too, a "Mormon" town, to judge from our experience, is likely to be a clean, well-built, tree-planted town, with a fair proportion of brick or stone houses, instead of the shabby wooden shacks so prevalent in Western villages. Perhaps these are hasty generalizations, based upon limited experience, but they are the impressions of Margaret and myself after a number of motor trips in several states. Credit to whom credit is due!

To most persons the suggestion that fish physiology could have any relationships of interest with human psychology would probably appear utterly fantastic. And yet we have recently been studying phenomena which seem definitely to link the two. For example, the nervous mechanism which leads a fish to react by appropriate changes to changes in the shade of its background—regardless of the intensity of the source of light—appears to have important features in common with the mechanism responsible for our own ability to perceive shades correctly under widely different conditions of lighting. That we can ordinarily recognize a sheet of white paper as white, quite as well by twilight, or even by starlight, as in midday sunshine, might seem to call for no special explanation. Yet much experimental study has recently been devoted to this problem, and there is still no full agreement on the part of experts concerning it. What you and I and the fish actually react to is the "albedo" of a surface, as it is technically called. By this is meant the ratio between the light reflected from the surface in question and the incident light by which this last is illuminated.

Those who are familiar with the "Weber-Fechner Law" in experimental psychology will be interested in learning that we find some evidence of the same loga-

rhythmic relation between stimulus and pigment formation in the fish as holds for man (within limits) between stimulus and perception.\* The significance of this correspondence it would be premature to discuss.

The foregoing is but one of the fields in which we have found interesting analogies between "human psychology and some things that fishes do." The subject has interested me so much in recent years that when I was elected one of the vice-presidents of the American Association for the Advancement of Science (chairman of section F) in 1938, I chose the above title for my "annual address."

The first half of this address was altogether conservative and proper. Had I been struck dead at that point, I should have remained eligible for interment in hallowed ground. But in the latter half of the address, I renounced any claim which I may previously have had to scientific respectability. After outlining the generally accepted facts regarding the spawning migrations of the Pacific salmon, I brazenly declared my disbelief in the adequacy of any special sense known to the physiologist to guide these fishes on the return journeys to their spawning grounds. Following this, I took a further step into the scientific underworld, and contended that recently offered evidence for "extrasensory perception" in man deserved respectful consideration. At the close of the meeting, I received the customary kindly compliments upon my address, as a literary product, and congratulations from one or two upon my "courage." Whether any one of my audience agreed with me in the views which I had set forth I do not know. In any case, no one came forward to tell me so.

I am far from being committed to the belief that extrasensory perception (whatever that means) is an established fact, either for fishes or for man. But I am very much of the belief that the prevailing attitude of

\* This seems to hold for melanin, but not for guanine.

utter intolerance is not the one best adapted to reach the truth in the matter.

"My intention, in this last section of my address, is to insist upon the possibility that in both man and some other animals, impressions from the environment may not all be mediated through recognized organs of special sense which are sensitive to recognized modes of chemical or physical stimulation. This does not mean that I wish to remove a large and important class of phenomena from the field of natural science. There is abundant opportunity for rigidly exact investigation here, both in the case of man and fish. And I believe that it is our present duty to settle some of these highly controversial matters by experiment, instead of dogmatically denying them or complacently ignoring them."

Fortunately, in the case of man at least, investigations are now in progress which may accurately be described as "rigidly exact." The experimenters of the Duke University group have fully considered the criticisms which have been directed against them, and have devoted much of their effort in recent years to revising their technique in such a way as to meet and even to anticipate such criticisms. Their procedures, as described in their recent publications, would seem to be as error-free as any that could be devised for the purpose.

I must acknowledge that my own reaction to these studies is still one of bewilderment, and this after a careful perusal of the printed reports of the work and after a very pleasant acquaintance with Professor and Mrs. Rhine and some of their associates. It can hardly be questioned that this entire class of phenomena would be very difficult to fit into our "mechanistic" picture of the universe, and indeed the difficulty increases rather than diminishes as the claims of the "ESP" school are analyzed. Particularly is this true of their recent claims regarding "precognition" (forecasting) and the influence of the will upon throws of dice.

Their evidences for "extrasensory perception," as most of my readers probably know, are based chiefly upon the seeming ability of some persons to reveal the identity of cards concealed from them, more frequently than would be possible were chance alone involved in the matter. Great care has been taken in the more recent experiments to exclude every possibility of sensory clues on the part of the subject, and likewise to exclude the operation of chance.

It is noteworthy that the occasional very high scores reported by these observers were obtained chiefly in the earlier years of the experiments, while in recent years the operation of "ESP" has been revealed only through the statistical treatment of great masses of individual records and the calculation of probabilities. Latterly there have been no "star performers," whose achievements were obvious throughout an experiment without need of any mathematical analysis. A ready explanation of this circumstance suggests itself. The highly favorable earlier results may have been dependent upon sources of error which were later eliminated. However, it must be admitted that even these later results, as presented, indicate a high degree of probability. While few very high scores have been made by individuals, the number of records in the aggregate is very great, and their trend as a whole is consistent.

While I have conducted many such tests upon myself and friends, and have certainly approached the subject open-mindedly, I have thus far never succeeded in obtaining any evidence for extrasensory perception which seemed to me to indicate even a reasonable degree of probability.

Once more, then, what do I believe in this matter? I believe that we should try to find out the truth in the only way possible, namely by the accepted scientific procedures of observation and experiment.

## CHAPTER XX

### REFLECTIONS ON THE REAL VALUE OF SCIENCE

Throughout my mature life, I have written occasional articles which have had little or nothing to do with my scientific activities. They have been, in nearly every case, protests against trends or conditions which have seemed to me pernicious. Some of them have carried a fairly high emotional charge.

I have, for example, indulged in a number of rather passionate outbursts against the purely utilitarian defense of science—the claim, that is, that the value of science to mankind consists in its contributions to his physical welfare *and nothing else*. Health, comfort, convenience, speed—especially nowadays, the last—are the fruits by which the tree is to be judged. These and these alone constitute its claims to public approval and public support.

Some years ago, I was asked (for the first and last time) to give the regular weekly “talk” following the Friday luncheon of the local Kiwanis Club. In general, I am never keen for such experiences, but on this occasion I welcomed the opportunity to say something which would probably be unfamiliar to a business group. The ensuing disquisition follows very largely my address to the Kiwanians.\* Incidentally, it perhaps furnishes the reason why I have never been asked to address them since.

\* \* \* \* \*

### WHAT SCIENCE IS FOR

I have always sympathized very strongly with some remarks on this subject by the great English naturalist and educator, Thomas Henry Huxley. He speaks of

\*This, in turn, contains considerable excerpts from published articles of mine in the *Scientific Monthly* and the *Bulletin of the Scripps Institution*.

"blind leaders of the blind" who take the view that science is a "sort of fairy godmother, ready to furnish her pets with shoes of swiftness, swords of sharpness, and omnipotent Aladdin's lamps, so that they may have telegraphs to Saturn, and see the other side of the moon, and thank God that they are better than their benighted ancestors."

"If this talk were true," continues Huxley, "I, for one, should not greatly care to toil in the service of natural knowledge. I think I would just as soon be quietly chipping my own flint axe, after the manner of my forefathers a few thousand years back, as be troubled with the endless malady of thought which now infests us all, for such reward."

We may be certain, too, that the man of science would be the last person to wish credit for all the applications which have been given to his discoveries. If his researches into fundamental principles have made possible the radio and the cinema, X-rays and insulin, they have also made possible bombing-planes and technological unemployment. The student of fundamental problems can seldom claim credit for the beneficent applications of his discoveries, nor can he accept responsibility for the disastrous ones. We must not confuse the scientist with the inventor.

Unfortunately, however, the utilitarian point of view is strongly entrenched in the public mind. And more unfortunate still is the fact that our professional scientists themselves often adopt this sort of language when they talk to audiences of laymen, and may even rack their brains in the effort to point out some direct practical results to come from the studies which they are conducting in their own laboratories. This is pitiable. Such a seeming adoption of the current materialistic standard of values on the part of the scientist is calculated to confirm the public in the acceptance of that standard. If even the student of nature feels called upon to justify his dis-

coveries in terms of the material benefits which they confer, one can hardly blame the man in the street for concluding that these things are the end and aim of all science.

Worse yet, the integrity of the scientist himself is undermined. He can hardly persist in the disinterested pursuit of knowledge and at the same time shamefacedly conceal the real mainspring of his actions and pretend that he is digging for gold!

However, it must be insisted that we biologists are fully able to meet the utilitarian apologists for science on their own ground, and this without doing violence to the truth. We can show them how scientific studies of noxious insects have made it possible for us to protect our crops; how scientific breeding experiments have enabled us to combine the desirable qualities of two or more races of animals or plants; how studies of the mosquito have led to the suppression of yellow fever and malaria; how a thorough knowledge of human anatomy and physiology furnishes a necessary basis for medicine and hygiene; and so on throughout an endless series.

Furthermore, we could insist with entire truth that these practical fruits of biological science are not due merely to special researches directed toward these particular ends. They are rendered possible by our ever-growing mass of data concerning the living world as a whole, most of which data have been acquired by persons who have had no practical ends in view. This general background of knowledge concerning the phenomena of nature is the real soil from which nearly all of our practical discoveries and inventions have sprung.

Arguments of this sort could be presented in much detail and without doing violence to the facts. For myself, I rarely feel disposed to resort to such arguments. I contend that those of us who are professional scientists should demand that the same standards be applied to science in this matter, as are applied to music or literature or art or

religion. The pursuit of these subjects is not halted at every turn by the challenge to show their usefulness. They are, in themselves, credited with being elevating to mankind, and this is accepted by most persons as their sufficient justification. Why then should the scientist be expected to vindicate his results in terms of bushels per acre or miles per gallon, or some other unit implying an immediate relationship to man's physical needs?

It is a curious fact that one great branch of science, at least, has won widespread interest and approval, even large-scale financial support, without invoking the utilitarian motive at all. I refer to astronomy. Not that every phase of astronomy is devoid of any possible bearing upon practical affairs. But these are precisely not the phases which arouse popular interest. What appeal to the public in astronomy are the things which stir the imagination, the vastness and mystery of the universe, the infinitude of time and space, the amazing ingenuity which has enabled man to explore these depths. People do not ask the use of taking the temperature of a star or computing the distance of a spiral nebula.

However, I hope that I may not be misunderstood. Science may fairly be called upon to solve the problems of agriculture or engineering or medicine, or to assist in any other field where it is necessary to apply general principles to everyday needs. But when we go beyond this and seek to justify the existence of scientific research by referring to the practical benefits which it confers, we are guilty, in my judgment, of completely inverting the logic of the case. The intellectual, esthetic and ethical fruits of research, the fuller understanding of ourselves and of nature, are a part of that "higher life" which most of us, in theory at least, admit to be the end and aim of existence. To produce more food and clothing at a lower cost than before would seem to be a self-evident gain. But the ultimate effect of all this may be merely to increase the

number of human beings per square mile of the earth's surface. Once more, all these conveniences and "improvements," these time-saving and labor-saving devices are of no value except in so far as they release time and energy which may be employed to better advantage than before. If these are merely employed in doing on a larger scale the same sort of things which we are already doing, the gain is not obvious, at least to me. In fact, it is extremely doubtful whether a much greater quantitative expansion of our civilization is to be viewed as anything but a calamity. Yet a large proportion of those things which are popularly hailed as the beneficent achievements of science have this for their end and nothing else.

What we want is more knowledge and more culture, more fair play and more real happiness, not more business or more people. Some of us contend that science is its own justification. This is true if we mean merely that science does not need to seek justification by any practical benefits of a material nature. The advantages of holding a more consistent and satisfying conception of the universe in which we dwell, of being able to discern law where formerly there was only chaos; these to many of us loom greater than the advantages of being able to travel at dangerous speeds on land or through the air, or of spending our evenings harking to sugar-coated advertising by unscrupulous manufacturers.

There may seem to be a ludicrous disparity between such grandiose expressions of idealism and the actual personalities and day-to-day occupations of those of us who call ourselves naturalists. What have most of these to do with culture and happiness and more satisfying conceptions of the universe? It must be admitted that the actual contributions of most of us are pitifully small. But I think it also must be admitted that we are travelling in the right direction. The results of these labors, trivial as they may

seem, are supplying the only material out of which an acceptable philosophy of nature can ever be constructed.

No discovery has so completely overturned the earlier conceptions of life and nature as the law of evolution. Not only did this discovery effect a radical revolution *in the past*—one which is now completed—but even today it vitalizes much of our thinking in many fields of knowledge. To most persons who have really grasped this point of view it is probably more satisfying both to their intellectual and their moral natures to view the origin and history of our world and of its inhabitants as the outcome of unchanging natural laws, parts of a single coordinated process of infinite duration and extent. Indeed, to an increasing number of persons, this conception is the only one consistent with the demands of religion itself. The more primitive views of creation, bequeathed to us from the childhood of our race, are today a serious affront to our intelligence if offered as anything more than myths or allegories.

Before closing these remarks, I wish to go on record as declaring that I regard all work in science as being justified by its *value to humanity*. But we must recognize the existence of various standards of value other than economic or practical ones. I merely insist upon applying to science the same standards as those which we apply to music, literature, art or religion, namely, their contribution to the life of the whole man, taken in the broadest possible sense.

In conclusion, let me repeat a brief characterization of science, for which I am responsible, and which I do not know how to improve upon. Science is not the handmaid of industry, nor is it a mere intellectual pastime. It is a quest for the facts and principles upon which to erect a true philosophy of life.

*Postscript—Not read to the Kiwanians*

After this recital, I trust it will not be necessary for me to insist that the views expressed are genuinely mine. Indeed I could mention no article of my creed which I hold with a firmer conviction, or which seems to me to rest upon a more solid basis. However, one's rational justification of any particular viewpoint is never an adequate explanation of the mental processes which led him to it. Belief, like any other response of the individual to his environment, is dependent quite as much upon subjective as upon objective factors. Otherwise the world would look exactly alike to all of us.

One ingredient of the psychological culture-medium in which the foregoing views were incubated is without doubt my distaste for financial matters, already referred to, and my general attitude of detachment from the "practical" affairs of life. Another—more creditable to me, perhaps—is my perennial aversion to shamming and to the reluctance to call a spade a spade. Years ago, as a government employe, I could not help being disgusted at times by the palpably disingenuous apologies for scientific research which I met with in some official publications. Far-fetched or impossible practical applications were offered in justification of work which should have needed no such defense. This sort of buncombe may seem necessary, perhaps, in wheedling appropriations out of Congress or the state legislatures. But no man of science can long practice deceit without blunting the most precious tool of his profession.

On the other hand, I am quite ready to admit that my espousal of an "idealistic" conception of science, and my recoil from the "sordid" point of view of the business world has been accentuated by a feeling akin to defiance which I have always had toward that supreme divinity "Business." Nor is this altogether a matter of disgust

with business ethics and standards. Financially speaking, we scientific men belong, for the most part, to the "unsuccessful" classes. All about us, we see wealth and influence pass into the hands of persons for whose culture and mental equipment we may have a very low regard. But they, strangely enough, do not accept this evaluation of themselves. Quite the contrary, they adopt an equally unquestioning attitude of superiority on their own part, while people of our kind are brushed aside as unpractical visionaries, incapable of performing the real work of the world. Furthermore, the whole political and social structure of the day seems to be on their side. The highest commendation that can be given to any performance is to call it "businesslike," while to "succeed in life" means—well, just that. What else could it mean?

While I am probing into innermost motives, I must cite another bit of soul-searching of which I was guilty a few years ago:

"We [scientific researchers] as a group are often credited by idealistic writers, outside of our own profession, with a 'disinterested love' of some abstraction called 'truth' or 'science' or what not. Of course we have too much sense to believe that sort of stuff ourselves. But we are, I think, prone to believe that we are actuated primarily, if not exclusively, by our intellectual interest in what we are doing. How far is that really true?

"I have confronted myself, and various of my colleagues, with some more or less embarrassing questions, which are not, I presume, altogether original with me. Would you keep on making these interesting observations if publication or any other outlet for your discoveries were denied you? I think that I hear an almost unanimous negative reply to the question. Frankly, it is the reply which I myself should give. I admit that the conditions suggested would be rather rough on you. So we'll let you publish your discoveries in full, but with the pro-

viso that they shall always remain anonymous. No one but yourself would ever know the secret of their authorship. I have a strong conviction that you would still hesitate, and that if you really decided to go ahead, it would be with vastly diminished zest. At least, I may so speak for myself. Nor is this necessarily a confession of vanity or selfishness. It is merely another bit of evidence that even *Homo scientificus* is a gregarious species. Our satisfactions are derived largely from the approbation and sympathetic understanding of our colleagues, from the interchange of ideas, . . . " (American Naturalist, Sept-Oct., 1940).

## CHAPTER XXI

### THE "VIVISECTION" BOGEY

California has long been the stamping-ground for the followers of strange religious and medical cults. Every town of any size boasts of from one to a half dozen "Churches of Christ, Scientist"; "chiropractors" are allowed by law to call themselves "doctors"; Aimee Semple MacPherson Hutton and "Madame" Katherine Tingley, each in her own way, not only survived, but rose to wealth and leadership upon notoriety which would probably have proved disastrous in many other parts of our nation.

A visitor to our state cannot fail to be impressed by the bewildering array of "divine" and "metaphysical" practitioners, predatory "psychologists" and exponents of every conceivable device for extracting tribute from the gullible sick. It is little to be wondered at that the enemies of scientific medicine — the antivaccinationists and antivivisectionists — are particularly aggressive here. Fortunately, the medical profession and the biologists of our universities likewise form powerful groups, and have thus far been able to block any serious interference with research. But one can never be certain of the future.

Several times since my own present residence in California, the charlatans, the obscurantists and the sentimental zoophiles have made common cause in the attempt to put over drastic "antivivisection" measures. The measure proposed, in one case, was so drastic that, if enforced, it would not only have stifled research in biology and medicine, but would have prevented anything but elementary teaching in either of these fields.

These attempts have always raised my temperature to the fighting point, so much so that I have been driven

to take some active part in the controversies raised by them. I find in my scrapbook an even dozen newspaper articles which I wrote on various of these occasions. A more ambitious article of twenty-five pages was published in pamphlet form by the University of California Press (Bulletin of the Scripps Institution, No. 6) and was distributed at the time to certain classes of readers in this state. How much effect, if any, these efforts of mine had in influencing voters I have no means of knowing. I cannot persuade myself that it was appreciable. Whatever good they may have accomplished lay in their calling attention to the real nature of experimental biology, and the real character of the campaign against it.

My own defense of animal experimentation has been based, for the most part, upon the broadly scientific and cultural value of the facts revealed, rather than upon their significance for medical practice. It is the latter, of course, which has almost invariably been stressed by both sides in controversial discussions of the subject. And it must be admitted that legitimate arguments of this nature are plentiful and of very great importance. On the other hand, it is only fair to add that exaggerated, if not actually disingenuous statements are sometimes made by the medical defenders of animal experimentation. Every biologist knows that a large part of the work conducted in our laboratories of physiology and experimental biology has only the remotest relation to questions of health or disease. They relate to fundamental problems of animal or plant life, and the investigators themselves are seldom thinking of any practical applications of their discoveries. Why must we tell the voters that medical progress is the real object of all such work? Why not try to give them a glimpse into the amazing world of life processes which has been revealed during the past hundred years or so, and point out to them—though this would hardly be necessary—that these things could only have been discovered through the study of living animals, *while living?*

I think that it has been the despicable tactics of the antivivisectionists that have stirred me to action more than anything else. Their complacent ignorance of all the essential data of the case, their deliberate misrepresentation of facts and intentional garbling of quotations, and their persistent slandering of deservedly honored men of science do not predispose one to treat them as fair opponents. The veteran Dr. W. W. Keen repeatedly exposed their deplorable ethical standards, and these cannot fail to impress anyone who has had any experience in this field of controversy. One of my own persistent critics in the local press some years ago—the secretary, by the way, of a “Universal Brotherhood”—resorted throughout to a style of argumentation such as we expect from a shyster lawyer. Such circumstances, and the fact that the only suffering which seems to arouse the ire of these people is that which they allege to be inflicted in scientific laboratories, should forfeit for their cause even that degree of sympathy which commonly goes out to honest but misguided reformers. This judgment applies at least to their leaders. In the ranks there are doubtless many sincere but deluded persons.

My essay, above referred to, was originally delivered as a public lecture, in a series held under the auspices of the California Academy of Sciences in San Francisco. When I had ended the discourse, the chairman, as is customary, called for discussion from the floor. In the present case, this precipitated such a tirade from a prominent local antivivisectionist that it was necessary to adjourn the meeting. Such action did not, however, subdue this overwrought zealot, who held the floor and continued her noisy harangue as the audience passed from the hall.

One incidental result of the publication of this lecture was to bring me into touch with that veteran surgeon and stalwart defender of medical research, Dr. W.

W. Keen, then a vigorous young man of eighty-one. I maintained something of a correspondence with him for a number of years. He died at the age of ninety-five, waging nearly to the last his crusade against his lifelong foes, the "A-V's."

Could I spare time at present for such a considerable task, I should be tempted to revise this bulletin, in minor ways, and republish it. I must repeat my insistence that this less strictly utilitarian appraisal of the results of experimental biological research is as much needed now, so far as the general public is concerned, as it was twenty-five years ago.

## CHAPTER XXII

### THE PHILOSOPHY OF THE BOOSTER

The obvious relation between the growth of population and the destructive assault upon nature long stirred in me an intense antipathy toward the type of citizen who glories in the name of "booster." That noisy proponent of the "bigger and better" idea, so mercilessly satirized by Sinclair Lewis, has long occupied for me the rank of Public Enemy Number One. He has, needless to say, a plausible line of sales talk, which has convinced a considerable part of our population that booster and good citizen mean pretty much the same thing.

While I formed rather early some pronounced impressions of my own on the subject, I made an effort a number of years ago to learn something more definite concerning the relations between the size of a city and the welfare of its citizens. To my surprise, I found that little information of the kind which I sought was available. At least I was so informed by one of our leading American students of population problems. Since I had neither the time nor the training for undertaking a competent research into the problem, I conceived the idea of soliciting the opinions of a number of representative California citizens.

As a result of this inquiry, I prepared a paper which was presented before a symposium upon population problems held at Tucson in the spring of 1930, and which I read later to another scientific group in San Diego. For various reasons this essay has never been published. During the long, lean years of the depression, the booster suffered so severely from malnutrition that the publication of my indictment did not seem timely. And now

with the catastrophic growth of many of our Pacific Coast communities, resulting from the recent expansion of war industries any disposition to bewail this trend would seem to be futile if not altogether ridiculous. Nevertheless, the recording of unattainable ideals may have value. In this belief, I am presenting herewith some excerpts from my essay. It commenced with a parable.\*

There was once a flock of sheep, living contentedly in a peaceful valley, walled in by beautiful mountains. They had lived there for a good many years, but the flock was not a large one and it had increased but slightly in numbers during that period. The yearly advent of the lambs in the spring was nearly balanced by deaths among the older members of the flock. And there was, up to that time, very little influx of strangers from other valleys.

So there was plenty of room and pasturage for all, and peace and contentment prevailed. They enjoyed their glorious climate and wonderful scenery. But being sheep, they took these things for granted, and they didn't realize why they were so much better off than their neighbors in some of the older, more densely settled valleys across the mountains.

One day a wily old ram—rather a newcomer, by the way, who had somehow acquired a bell, and who posed as a "civic leader" among these sheep—held forth in solemn discourse.

"Fellows," said he, "it's time we woke up. This valley is not developing a little bit. Why! San Gabriel Valley over there across the mountain isn't half as big as our valley, and yet it supports ten times as many sheep. It really isn't fair that we should be keeping all this fine land and climate and scenery to ourselves, when

\*This last was published in the *Birth Control Review*, July, 1930. Reproduced here with the consent of that review.

twenty times as many sheep could be enjoying it. (No one noticed that the old ram's tongue was in his cheek when he made that last remark). And then just think how much better off we'd be ourselves if we had all those fine sheep here with us. Come on, let's all pull together and put Peaceful Valley on the map!"

Thus spake the old ram, but only after he had quietly secured options on nearly all the choice grazing land in the valley, which he schemed to subdivide and to unload upon the newcomers, with the help of the slogan "Five acres and independence."

Being sheep, they all listened to him and followed his advice—all save another old ram, wiser than the rest, who gathered together his family and started on a long trek toward the desert.

Well, they did put Peaceful Valley on the map, with all the bleating and stamping and jangling of bells in which only a flock of sheep is really adept.

And pretty soon there was standing room only. There was nothing but noise and dust and confusion, night and day. The last blades of grass disappeared, and then they went for the brush and the small trees. Peaceful Valley was peaceful no more, and with its peace went its beauty. The green pastures were trodden into bare sand; the wildflowers were gone; the lower mountain slopes were stripped of their picturesque vegetation.

At length famine arrived. Most of the sheep died, either from starvation or disease. Only a few of the very sturdy ones made their way to distant valleys, not yet overrun by the all-consuming herd.

"What became of the wily old ram with the bell?" I hear someone ask. I hope you don't really need to be told that. Why, he pocketed his proceeds and moved on to another valley, just before hard times set in at home. He is even now engaged in promoting another highly successful development scheme. And the strang-

est part of all this strange tale is that among his most ardent fellow-boosters are some of the very sheep that passed through the terrible ordeal in the former Peaceful Valley. But then, you know, they are only sheep!

\* \* \* \* \*

My parable does not, I trust, need any interpretation. But I shall restate the situation in other words. To many of the best citizens of California and doubtless of a number of other states, the rapid growth of our towns and cities, and the steady influx of settlers into all sections, both urban and rural, is nothing less than appalling. Those of us who do not speculate in real estate, own stock in hotels or tourist resorts, or otherwise profit by this human avalanche, wonder why we should be expected to applaud it all. We wonder more yet why we should be taxed to pay for advertising our community in eastern magazines, and soliciting further immigration. We witness on every hand the passing of many of the things which those who love tranquility and natural beauty prize most in life. All too often, we must look on helplessly while the main trends of development are dictated by blatant, uncultured persons, who can think only in terms of rising land values and the resulting profits to themselves.

The passing of the wilderness, the needless destruction of faunas and floras, the clearing of lands which are utterly worthless as farms or home sites, and the general vulgarization of natural scenery everywhere, is one aspect of the picture. Another is the steady advance of urbanization, with all its attendant evils, a subject which seems to be calling forth an increasing amount of discussion by those who are seeking to improve the lot of mankind.

Speaking as a biologist, there are two aspects of this nation-wide trend which cannot be overlooked. One is the widespread destruction of animal and plant associa-

tions, even to the complete extermination of some species. Such happenings increasingly handicap the zoologist and botanist in general, but more particularly the student of ecology, geographic distribution or organic evolution. The other aspect is the proven serious dysgenic effect of urban concentration upon the human race itself.

For various reasons, however, I propose, in the present article, to discuss neither of these biological aspects of the population problem, but to deal with some of its social aspects. This although I make not the slightest pretence to being a sociologist. Whether I have been justified in roaming so far beyond the confines of my proper field, I shall leave my readers to judge when I have concluded. I may say, however, that I have dealt largely with matters of common observation and have sought and obtained the help of a number of persons who are far more competent than I am to discuss the problems here at issue.

Unfortunately this field appears to be one in which scientific data are very difficult to obtain. Data of a sort, it is true, are accessible to everyone. We can watch the growth curves of population for any state or city. But the very fact that these trends of increase are viewed with pride and mutual felicitation by one section of the community, and with serious apprehension by another, shows how little actual knowledge exists regarding the effects of this expansion upon human welfare.

Careful studies have been made upon the maximum productivity of the soil in agricultural regions, and of the minimum amount of space and food upon which the human animal can exist and maintain its mental and physical health. Once more, in the arid Southwest, data are available regarding the limit of population growth which is possible with a given water-supply.

All of these matters, concerning which the writer has little detailed knowledge, are of course relevant to

any general study of the population problem. But they relate, for the most part, to limiting factors only: how many individuals can be crowded into a given space without destroying them?

The question which chiefly interests most of us is this: what conditions afford the maximum of happiness? But happiness, most emphatically, is not a thing which can be quantitatively measured. Moreover, like most psychological states, this depends quite as much upon the organism with which we start as upon the environment in which we place it. Thus, in relation to the population problem, we have at one extreme what we might call the negatively anthropotropic type, the lone prospector or "desert rat," to whom the sky is the only acceptable ceiling, and the very sight of his fellow man soon becomes distasteful. At the other extreme, we have the morbidly gregarious type, which constitutes the teeming multitudes of our great cities, and which becomes almost panic-stricken if left alone.

Probably all of us fall within these limits, some nearer one extreme, some nearer the other. I suspect that most of us naturalists would find the life of the "desert rat" less irksome than that of the "strap-hanger" in a New York subway. But the point which I wish to make here is that whereas our population displays a wide range of tastes and preferences in this matter of the optimum density of population, no one ever takes the trouble to ascertain the average or modal attitude of any community in this respect. In practically all cases, the control of a community's development passes automatically into the hands of those who profit materially by its expansion. These are not only the ones who rule us, but the ones who chiefly control the press, and who profess to represent the aims and aspirations of the community before the world at large.

In my own state, for example, we read discussions, from time to time, of what "California" wants, say in the question of water and power from Boulder Dam. We and the nation in general are also frequently enlightened as to what "Los Angeles" or "San Diego" wants in one matter or another. In much the same spirit, Shakespeare depicts the sovereigns of old as addressing one another as "England," "France" or "Egypt." The mass of the citizens is intended as little in one case as in the other.

So far as the "booster" spirit may be regarded as a philosophy at all, and not merely as an emotional state or an appetite, it seems to be based upon a number of false assumptions.

First of these is the identification of progress with increase in size. Rapid growth is regarded as an indication of health, cessation of growth as an indication of stagnation or decay. But this is not the lesson which biology teaches. Reference to the life-history of almost every organism, including man, shows us that the most important functions are performed after growth ceases. If the biological analogy suggests anything, it is that the stabilized condition of a mature community, having a stationary population, should be more favorable to higher human activities than the adolescent period of rapid growth.

Another bit of false logic proceeds as follows. If a thousand individuals derive in the aggregate, a certain amount of enjoyment from some feature of the environment, then ten thousand individuals should derive ten times that amount of enjoyment. Therefore everything worth while should be made accessible to the greatest possible number of persons. This all sounds very democratic and altruistic, and it has always served as convincing sales-talk for those who scheme to exploit some precious bit of nature in their own interest.

The fallacy in the foregoing argument is almost too obvious to point out. The arrival of ten times as many persons in the Great Open Spaces does not mean that ten times as many persons will enjoy the Great Open Spaces; it merely means that the Great Open Spaces will cease to exist. Our nation used to proclaim itself a haven of refuge for the oppressed of the world. And they came! Very tardily we aroused ourselves from this altruistic delirium and passed our exclusion acts. For so doing we have been called selfish. Be that as it may, very few of us would probably vote to restore the old conditions.

The booster glories in being an optimist, but his optimism arises largely from his blinking the facts. One cannot fail to be impressed by the extraordinary degree of myopia which afflicts some of those who write popularly upon the problems of population. They talk as if our tiny globe were as big as a spiral nebula, and as if its saturation-point, in respect to population, lay in a future so remote that it could be left entirely out of our calculations. Various expedients which, at best, could merely postpone the end of the race which mankind is running with his food and water supply, are seized upon as final solutions of the difficulty.

Nor are such shortsighted viewpoints confined to thoughtless persons. I cannot refrain from citing here the reply of a distinguished hydraulic engineer to a question raised by me in the course of the present inquiry. "When the safe limit of population, in relation to maximum water supply (for San Diego) is reached, is there any reason to believe that population will not continue to expand until the point is reached where every bad year will bring a water famine?"

The answer in full was: "No. The present duty of water could be more than doubled without detriment to health and could be accomplished easily by making use of spring faucets compulsory, and if necessary materially in-

creasing water rates with consequent diminution of extravagant waste. Reclamation of sewage, including salvage for fertilizer, will doubtless be generally practiced in arid regions in the United States before the water resources of San Diego County shall be required and conserved for actual consumption."

These statements are interesting and important, but I submit that they do not in the least constitute an answer to the foregoing question!

I have all along been aware of one obvious criticism which will arise in the minds of most persons—a criticism so obvious, in fact, that it may seem to render futile any serious discussion of these matters. The objection consists merely in the challenge: What are you going to do about it? People will insist upon coming into an attractive and sparsely settled district, whether you want them or not. That being the case, why shouldn't we make as much money as possible in catering to their needs?

In a certain sense this objection is unanswerable, and the mere fact that such an argument should be so nearly conclusive, under present conditions, is a measure of how far we still are from real democracy. A true democracy would strive toward the greatest measure of happiness for present and future generations. It would ascertain, for each community, the size which it could reach before the disadvantages of growth began to outweigh the advantages. Then it would cease to grow. *Keep people out?* Why couldn't we keep them out—new permanent residents, that is? There is nothing to compel us to issue more building permits, nor to license any more hotels. And if the welfare of the citizens had been taken into account, this shutting of the gates would long since have taken place in all of our large cities and many of our small ones.

"Absurd!" you exclaim. So it is in our present social order. But it would not be absurd in an all-out democracy. For our existing social order in our Southwest

we might fittingly adopt the term "realtocracy," or government by the "realtors," a regime in which the fundamental policies are controlled by their effects upon land values, and where all business is adjusted to the expectation of a rapidly increasing population.

One need not be a disciple of Henry George, nor a political economist of any school, to see in land speculation and exploitation the root of some of our major social ills. *Are these phenomena ones which lie entirely beyond the voluntary control of mankind?*

Thus far, I have presented my own thoughts and feelings relative to some of these vital matters. With a view to finding out the attitude of some representative California citizens toward the great population influx, and the means which have been employed to further this, I devised some years ago a questionnaire. This questionnaire and the answers received thereto cannot be discussed here in detail, although many of the responses were highly instructive.

Among those replying were officials of chambers of commerce and of public service corporations, an assortment of business and professional men, one editor, one labor leader, several naturalists and several economists, sociologists and "social workers," two of the latter being women.

The replies naturally differed greatly in worth, but many of them were patently the outcome of careful thought. Their nature, in many cases, could have been predicted in advance, in view of the interests represented by the persons in question. On the other hand, there were a number of distinct surprises. A few persons whose vocations might have seemed to throw them into the "booster" class expressed themselves emphatically on the opposite side.

Despite the contradictoriness of many of these replies, one thing seemed certain. The greater number of

those persons whose views would have most weight with a scientific audience were emphatically opposed to that policy of community advertising and self-glorification to which the term "boosting" is applied. The advantages of a great, and especially a rapid, concentration of population were either denied outright or viewed with skepticism.

The outstanding lesson to be drawn from this inquiry may be stated briefly. In view of the present lack of exact knowledge relative to the effects of population growth upon human welfare, and particularly in view of the divergent tastes, desires and ideals of different elements of the community, it would seem to be criminal folly to surrender all control over these vital matters to the small group of persons who are financially interested in promoting a rapid increase.

It is too early, perhaps, to talk of restoring a democratic control over our natural resources and the fundamental conditions of life under which we and our descendants are destined to live. But there are certain things which each of us can do even now. I shall conclude by summarizing these briefly.

(1) Let us have the courage of our convictions. If we are really convinced of the fundamental viciousness of this booster program, let us say so in unmistakable language, and not lend our voices to the noisy chorus: "Watch Gopher Prairie grow!" Let us find out first who wants to make it grow, and how this growth will affect ourselves and our families.

(2) Let us work for the repeal of those archaic laws which keep the knowledge of birth control from the masses.

(3) Let us oppose community advertising, paid for out of public funds.

(4) Let us be very slow in voting bonds for additional water supply, road improvements and the like, when

the avowed purpose of these things is to bring in an additional swarm of people.

(5) Most important of all, let us do what we can to promote scientific investigations calculated to reveal the actual effects of population growth upon all phases of human welfare. Then let us work to have these findings incorporated into our public policies, however drastic the steps which may prove to be necessary.

Five years earlier than this Tucson meeting, I was greatly surprised to receive an invitation from Margaret Sanger to participate in the Sixth International Neo-Malthusian and Birth Control Conference, to be held in New York City in March, 1925. Just how I came to be selected as one of those to present papers at this important meeting I never learned. Up to that time, I had never published anything dealing with birth control. Nor had I met or even corresponded with Mrs. Sanger. However, I gladly availed myself of the opportunity offered.

The meeting proved to be instructive and stimulating to a high degree. Some of the participants were men and women of national or even international prominence. Despite her somewhat spectacular career, Margaret Sanger impressed me as a person of much quiet force, with nothing theatrical in her bearing. Outwardly, she gave little evidence of belonging to the class of "woman reformers." But at this great meeting she plainly received the deference due an acknowledged leader. That she has aroused the enmity of some other leaders of the birth control movement is a regrettable fact which I am not in a position to explain. Are not progressives in general more prone to divide into rival groups than reactionaries? And is this not one reason why progress is so slow?

The contributions to the program were grouped in a number of sections, representing the various aspects of the subject in hand. They ranged in scope from technical papers of a biological, medical or statistical character to

general discussions and propaganda. Although I was invited as a biologist, my own contribution belonged distinctly to the latter class. It was entitled: "Is the Voluntary Control of Human Population an Idle Dream?" In the space of some twenty pages, I touched upon nearly every phase of the birth control problem, naturally stressing those phases which were nearest to my own heart, namely the all-importance of the quantitative and qualitative regulation of population.

Of course the booster came in for his share of pomeling: "No one would think of denying that concentration of population, within certain limits, is necessary to the fullest development of civilization. But in this regard, the size of the community is of slight importance as compared with the worth of its individual citizens. 'The Glory that was Greece' centered in a city which was not, perhaps, more than a fourth as large as modern Los Angeles [written in 1925], while medieval Florence and Venice could be matched, in size, by numbers of third-rate American cities, unknown for their contributions to our higher life."

However, the paper was, I believe, made up of stuff which needed to be said, and which, I think, still needs to be said to the world at large. Whether it was well adapted to a group of convinced and well informed birth control exponents I am not at all sure. It was certainly not the technical contribution of a professional biologist.

## CHAPTER XXIII

### SOME FRANK COMMENTS ON WHAT MANY CALL RELIGION

I shall briefly record here some of my impressions of that great welter of contradictory thoughts and emotions which is suggested by the word "religion." I have, throughout my life, given much serious thought to these matters. That I have arrived at views so largely negative is not, therefore, due to any mere lighthearted dismissal of the claims of those who think differently. However, I cannot believe that in this year 1945 the following forthright statement will prove shocking to any person who is likely to read this book. Nowhere has the spirit of the times shown itself more strikingly than in the increasingly tolerant attitude of educated persons toward religious differences.

Speaking thus frankly, I am forced to admit that many of the associations called up in my own mind by the word "religion" are repugnant ones. I think of a thing which must be treated as a privileged subject, only to be discussed in reverential tones and in words of a special vocabulary; a domain in which any touch of levity is rebuked as "blasphemy." I think of that volume of Hebrew folklore, with its primitive myths and manifest contradictions, whose real value to mankind might have been so much greater had it not been handicapped by the absurd claim that it was the "Word of God." I think of the denunciation and outright persecution which were, and still are, visited upon those who dare to question the prevailing beliefs of any particular time and place. I think of the Tennessee "monkey-trial"; of national prohibition; of the fanatical opposition to birth-control, to reasonable divorce laws and to mercy-killing ("euthanasia"). I think

of the manifest impotence of organized religion in the face of those monstrous real evils which continue to afflict human society in every land, and have converted vast sections of the world into shambles.

This is an extremely lopsided picture of religion, the reader may protest, and I will admit that it probably is. However, the present volume is primarily a record of my own mental experiences, and this is a picture which I cannot banish from my mind. That is perhaps my misfortune. But I none the less insist that any true appraisal of religion cannot exclude these more somber aspects which I have just stressed. Without these, indeed, the picture would be quite as lopsided as the one which I have sketched.

I have written as I have, knowing full well that many of the greatest figures in history have been devout church members. And I bear in mind, too, the fact that some of the finest characters whom I have known personally have been religious according to accepted standards. Does it necessarily follow, however, that it is their religion which has made them so? One would have to state more precisely what he means by religion. If religion be identified, as is so often done, with strength and beauty of character, unselfishness and the like, then the question has already been settled by definition. Only the religious are good, because goodness and religion are identical. But this, I am sure, is a definition which would not be generally accepted.

One very familiar plea for religion commences with an insistence upon the distinction between religion and theology. "I believe in religion, but I have no use for theology" is a declaration frequently heard. But an endeavor to define these two words would certainly not reveal any approach to unanimity among the various groups of believers. What are cherished as essentials of "religion" by a "Fundamentalist" or by a Roman Catholic would surely be dismissed as the rankest kind of theology by a

Unitarian. And there seems to be an increasing number of persons at the present time whose "religion" consists entirely of emotional and moral elements, and who lay no stress upon *beliefs* of any sort. The former, in fact, are the aspects of religion which have been the potent ones in molding human character, albeit the credit is so often given to their appalling accompaniment of mythology, superstition and dogma.

Indeed the word religion is used in so many and in such diverse senses that it would be in the interest of clear thinking if we could retire it from use altogether. What kind of "religion" is intended, for example, when one who objects to the intrusion of the Roman Catholic church into politics is accused of "religious intolerance"? And again what kind was meant when the man who invented the word "agnostic" to define his own philosophical standpoint was characterized by a member of his family as "the most religious man I ever knew"? It would be hard to find anything in common between two such divergent uses of the same word.

Personally, I prefer not to designate any beliefs which I myself now hold or any emotions which I experience as "religious." The word is too ambiguous as well as too closely bound up with viewpoints which I utterly repudiate.

The same may be said of the word "God." One is sometimes challenged to state: "Do you believe in God?" If the answer is negative, you are an "atheist," with all that that implies—certainly not a good citizen or a friend to be cultivated. In some states of our Union, indeed, your testimony would not even be accepted on the witness stand. This, too, by act of the legislature! Not many persons, whatever their beliefs, will admit that they are atheists. This is left to a few noisy "radicals," who have renounced "respectability" in all of its aspects.

Am I, then, an atheist? I really don't know. What do you mean by an atheist? "One who doesn't believe in

God," you say. Well then, what do you mean by God? There is the crux of the whole matter. If you mean the God of William Jennings Bryan or of Billy Sunday, or the Holy Father at the Vatican, then I am an atheist and a militant one. But if you mean some sort of undefined and undescribed universal mind, in some unknown way underlying phenomena—that is something else again. Few thinking persons would deny such a possibility. In fact, it is likely that a majority of thinking persons would assent to it.

The fact is that the words "atheist" and "infidel" belong to the same class as those other abusive epithets, "radical," "red" and "communist," which are so much in vogue among our nitwits at the present moment. They are all convenient, ready-made substitutes for thought, calculated to arouse hostile emotions against the persons so stigmatized. Divested of this emotional context, they have as little real meaning as those various unprintable terms of vulgar abuse which trip so lightly from the tongue of the man in the street.

To try to divide mankind into two classes, those who "believe in God" and those who do not "believe in God" would be supremely silly. There are, of course, profound differences among our conceptions of the underlying reality of the Universe. The "religious" point of view, as the word is commonly employed, rests on a belief in a God whose plans have regard for the welfare of the individual human being, and with whom the individual human being may enter into some sort of personal communion for the sake of his material or spiritual welfare.

My own life experience, as well as my studies of the operations of nature, render such a viewpoint utterly untenable to me. I find no reason for believing that the human individual is a more permanent aggregation of matter and energy than any of the other multitudinous types of individuality, organic and inorganic, which are forever

being differentiated and again disintegrated amid the universal flux. Furthermore, I find no reason for believing that pleasure is any more fundamental in the scheme of things than pain. Biologically speaking, indeed, it seems possible that pain is the more basic of the two, and there is no question that it is capable of being vastly more intense.

Still, it is a grand panorama which we behold—at least if we can overlook our immediate foreground—and I, for one, am ready to admit that it suggests the workings of mind. But to me it does not suggest the mind of a sovereign power, ruling from without. It suggests something which bears much the same relation to the visible universe that our minds bear to our nervous systems—however that relation may be conceived.

In this panorama we can discern certain cosmic trends, which we have come to characterize by the general term evolution. Order arises out of chaos; the homogeneous becomes heterogeneous; integration accompanies differentiation. Upon the earth, "lower" types give way to "higher"; civilization, of a sort, succeeds savagery; intellectual, ethical and esthetic standards advance, even if very intermittently. However, nothing seems plainer than the fact that the entire process is a rigidly impersonal one, whether we have regard to animals or to man. Types which we call "higher" are, *on the whole*, the ones which survive. But this is true only in a statistical sense. The fate of the individual is largely a matter of chance, meaning by this that its fate, much of the time, has no relation to "fitness" or "unfitness" of any sort. Since man began to reflect at all, it must have been only too obvious to him that the incidence of pain, misfortune and death bears very little relation to the social worth of the persons concerned.

But the race, we admit, does progress in a blundering, hit-or-miss fashion toward a goal which we believe to be higher. That sounds impressive, until we reflect a bit further. We know almost as well as we know any other

scientific fact, that the life of our planet, as an abode for mankind, is strictly limited. Within a fraction of a second, on the cosmic scale, our race will have run its course, and all this agonizing evolutionary struggle will have become, if anything at all, merely one of an infinite number of memories in the cosmic mind. *If anything at all!* Does this last possibility leave a substantial enough shred of faith to satisfy those who demand an unending continuance of their own personal existence? Each of us must answer this question for himself!

All of the world's dominant religions, as has often been pointed out, came from the East, where mankind was accustomed to absolute despots who had to be flattered and placated. And so the dogma arose of a perfect divinity, all-wise, all-good and all-powerful. Such a notion has its counterpart in the philosophical conception of a changeless "Absolute," underlying all the changes in the phenomenal world. I am not a philosopher, and I know nothing of the metaphysical obstacles to the alternative to which I incline, but I have long been intrigued by the notion of a creative principle which is itself undergoing evolution. This great, chaotic universe, wasteful, cruel and imperfect in countless ways, is so because both it and its maker are in the process of making. Creation is a vast process of trial and error, and the creator itself cannot foresee a result prior to any experience of this. Such a view divests the creative agent of some of its omnipotence, to be sure, but it seems to me the only alternative to a view which makes cruelty and injustice basic in the organization of the universe.

And as for our metaphysical critics, I wonder if we really need to consider them at all. Do they really agree among themselves as to what is intellectually permissible and what is not? Did any one of them ever "prove" a point by irrefutable logic without one of his fellow-metaphysicians "proving" by equally irrefutable logic that he

was all wrong? Having had little training in the history of philosophy, I merely ask for information.

One of the many fundamental difficulties with the "Heavenly Father" idea is the lack of any real evidence that the "father" has ever endeavored to communicate with his "children." Like *O! Man River*,

He must know somethin'  
He don't say nothin'  
He just keeps rollin'—  
—along!

We have, I trust, passed beyond the need of refuting the so-called "revelations" upon which the various historic religions are based. As Jacques Loeb has well expressed it, the rival claims of these merely cancel one another. There are, however, numerous worthy individuals at the present day who believe that they actually enjoy personal communion with God. They will not argue the question. They "know" in a more profound sense than they ever could know through their senses or their reasoning processes.

Perhaps they are right. At any rate, their assertions can hardly be disproved. To reply that this state of "communion" is a purely subjective phenomenon, and to point out that similar states of ecstasy may be brought about by mental disease or by narcotic drugs would hardly carry conviction to one who had undergone the experience. It does seem rather strange, however, that this precious privilege should be bestowed upon such a small proportion of us mortals. It cannot be that the rest of us have no need for divine comfort and encouragement in our sufferings. We cry out for help, but the cry is in vain. Perhaps, after all, there is a very special technique for securing the consolations of the Almighty, as the churches seem to assure us. However that may be, a rapidly decreasing number of us, I fear, are disposed to acquire any such technique.

All this does not mean that I never experience any degree of "cosmic emotion." My reactions to the starry sky, or to full moonlight amid beautiful surroundings are, I think, altogether normal. These feelings are strongest, perhaps, in the solitude of the desert. Indeed that is, I believe, one of the chief reasons why I am so fond of the desert. What this emotion is I shall not attempt to describe. It could not be described to anyone who had never experienced it, and to anyone who had experienced it no description would be necessary. I may say, however, that there is a distinct trace of what many would call "spiritual elevation," including at times a possible moral element. On the other hand, I cannot be sure that my "cosmic emotion" contains any detectable trace of gratitude or love toward a higher power, feelings which are supposed to be so basic in religion.

Indeed, there are, I must confess, moments in my life when quite the contrary feelings gain control of me. At such times, I throw all my intellectual convictions to the winds, and personify the universe as a malignant being, visiting me with persecution, and guiding my footsteps into never-ending blunders and failures. In short, I am superstitious, profoundly so. This may seem a strange admission from one who has always been so scornful of superstitions in others. However, I am using the word in a somewhat different sense from the ordinary, though I am not, I think, departing from strictly legitimate usage. If superstition may be correctly defined as "belief in the direct agency of superior powers in certain extraordinary or mysterious events" (one of the definitions to be found in Webster's Dictionary), then not only I but most other persons are superstitious. I do not, of course, refer to our reasoned beliefs. We repudiate rationally much which, in another and perhaps deeper sense, we actually believe. Why do we use profanity? I should perhaps have said: Why do we *all* use profanity? For I doubt whether any-

one is altogether free from the emotional attitude of which this is the external manifestation. It is our unreasoning protest against the malign powers which we subconsciously believe to exist, and which, for the moment, we consciously believe to exist. Whether it is a "God Damn" that we utter, or "Jesus Christ," or "Hell" or "The Devil," or something worse, is all one. We resort to the vocabulary which we first learned from the "bad boys" of our childhood days. But underlying such an utterance is a resentment, often a passionate one, at some thwarting of our wishes by the intervention of an invisible personal agent. If you do not believe this, then why do you swear? Of course, when we cool down, we realize the absurdity of such a belief, and relegate it once more to the subconscious, or whatever else we may choose to call the potential part of our mental make-up.

There are times when things persistently go wrong with us, often in such a way as to suggest malevolent personal interference rather than the orderly processes of an impartial nature. At such times, most of us, consciously or unconsciously, accept the former of these alternatives. Else what do we mean by bewailing our "bad luck"? The experimental scientist offers no exception to this universal demonolatry. However firmly he may believe in a world where identical causes lead to identical effects, his actual experience frequently stands in flat contradiction to this. The same experimental set-up—so far as he can make it so—gives him results which are unaccountably different, leaving him oftentimes bewildered and discouraged. Intellectually, he is certain that some unknown factor in the experimental situation has been changed, however helpless he may be in his endeavor to discover this. That, of course, is the explanation which he offers to his readers when he publishes. Emotionally speaking, there are moments when a Personal Demon cannot be kept out of the picture. If you doubt this, your mental constitution is different from

mine. Or, I prefer to think, your powers of introspection are insufficiently developed.

I shall leave to my philosophically minded readers the task of identifying this Personal Demon (the "P.D.", as some of us familiarly call him in our laboratory)\* with the famed "Uncertainty Principle" of Heisenberg and his legion of followers. I am disposed to feel that my discovery, which surely antedates Heisenberg's by several decades, entitles me to full priority in the matter! All that Heisenberg seems to have added is the mathematical garnishing.

Am I, then, repudiating a personal god, only to accept a personal devil? Hardly that! Intellectually, I repudiate them both. The workings of the cosmic machine are entirely impersonal. Any feelings of personal relationship which I experience lie altogether in the realm of the emotions. It chances that with me the occasions which suggest personal intervention are chiefly ones in which my efforts are thwarted, if only through my own persistent clumsiness or forgetfulness. The resulting emotions are resentment and rage, and the responsible agent is felt to be hostile. There are very many other persons, fortunately, who find their evidence for supernatural intervention chiefly in occasions when luck is on their side. For them, the resulting emotions are love and gratitude, and the responsible agent is felt to be friendly.

Which of these reaction-patterns preponderates in an individual is, of course, a matter of temperament—largely an affair of the viscera and glands. It is much the same type of organic difference as that which determines whether a man shall be a pessimist or an optimist. For the happiness of the world it is well that persons of the latter type should preponderate. Not because their insight into the nature of reality is any more "true," but be-

\* See (facetious!) article by the present author "The philosophical basis of pediatrics" in the *Scientific Monthly*, August, 1942.

cause their reaction-systems are more likely to bring contentment to themselves and harmonious relations with their fellows. Such a state of inner and outer harmony is frequently associated with avowed beliefs of a "religious" character, but this is certainly not the invariable rule.

However that may be, the currently accepted religious optimism is doubtless more often a product of healthy minds and bodies. Indeed, it is customary to ascribe departures from such an outlook on life, wherever possible, to physical or mental infirmity, the assumption being that the existence of such infirmity would invalidate the views of those who hold them. However, as has been insisted by William James,\* religious or philosophical ideas must stand upon their merits, and cannot be explained away by reference to the alleged infirmities of their proponents. One might go further than this, and insist that the "abnormal" and "defective," if they are in a condition to reason at all, may be receptive to certain aspects of truth to which the complacent "normal" man is altogether blind.

From a pragmatic standpoint, as has just been said, it is doubtless well that the motivating articles of the popular faith should be accepted from those whose lives have been reasonably free from internal conflict. But in last analysis, we must bear in mind the partial and selective character of our procedure, and must restore the unwelcome missing elements of our picture whenever we wish to contemplate this in its entirety. And here we need the testimony of the "abnormal" as well as of the "normal," of the maladjusted and frustrated as well as of the fortunate and successful.

Admittedly, the judgments of the present writer are biassed, as biassed, possibly, as those of the complacent optimist who rejoices in an altogether "normal" personality. If so, I may none the less demand a fair consider-

\* *The Varieties of Religious Experience*, p. 19.

ation for these half truths of mine, if only that my better balanced reader may compute the position of the Golden Mean which lies somewhere between these two extremes. I offer my opinions for what they are worth, and leave the reader to apply the necessary corrections for personal equation.

\* \* \* \* \*

A final word of explanation may be in order. My negativistic conclusions, which may be profoundly unsatisfactory to some, have been entered here in the interest of clear thinking. Mankind's adjustment to the world he lives in requires that he shall face the facts, or at least the probabilities which must serve us as facts, and not take refuge in comforting illusions. To have discussed frankly, then, some of those beliefs which I regard as illusions would hardly seem to call for censure, although this is an all-too-frequent attitude encountered in "religious" discussions. What is called for is the refutation of my contentions, if they are wrong, by more valid arguments on the other side. Note that I have avoided telling anyone what he *ought* to believe!

Wherever the truth may lie, it is plain that great and increasing numbers of men and women are living normal and useful lives without the adventitious support provided by belief in the supernatural. But vast further advances are necessary in the direction of Christian ethics (but not of Christian theology!) if civilization is to escape the catastrophe toward which it is so rapidly heading.\*

\* One may speak thus without implying the exclusive claim of Christianity to the principles thus designated.

## CHAPTER XXIV

### EPILOGUE

The foregoing volume was commenced at Tucson in the fall of 1933, and continued at various times and places since then. Like most of my writing in recent years, this has been done in the great out-of-doors. I find it a salutary practice, when I really wish to concentrate, to move my office into the field. That is to say, I pile my books and writing materials—often, too, my lunch—into our car, and drive out of town to some spot where the landscape is pleasing and man-made noises and distractions are at a minimum. It is a practice which I can heartily recommend to others, or at least to others of my temperament.

Considerable parts of this narrative have been composed at our "Ranch" in San Felipe Valley, some seventy miles from home. Here, at an elevation three thousand feet, we have a forty-acre plot, largely covered with virgin woodland. Great live oaks and sycamores occupy much of this area, the more open spaces being given over to the "elfin forest" of chaparral—*adenostoma*, *ceanothus* and *rhus*, among others—or to such low brush as white sage and wild buckwheat, or again to dense tangles of the impenetrable "cat-claw."

We are in the narrow, upper end of a valley, between two diverging ranges of mountains. On our side, rises the long ridge of Volcan, clad, in its upper reaches, with coniferous forest. Across the valley, here but a mile wide, loom the steep, barren slopes of the Grapevine range, robbed of their moisture by the higher Volcan range to the windward of them, and affording a splendid example of what the meteorologists call a "rain shadow."

To the southeast of us, our valley gradually widens out and becomes increasingly arid as it descends to the desert. The scattered vegetation no longer covers the soil. Oaks and sycamores give place to the thorny mesquite, the desert juniper and various other dwarfed trees. The chaparral is replaced by a host of xerophytic shrubs, many of them dry and dead looking throughout much of the year, and many of them beset with vicious spines. The airy, dark green creosote-bush begins to appear, at first sparsely, then in abundance, as the territory becomes more and more arid. Cactuses increase in number and variety, the formidable Mojave yucca becomes a conspicuous figure in the landscape, and clusters of agave lend a Mexican touch to the scene. By passing down through one of the narrow gaps which pierce the grim barricade of treeless mountains, we can readily reach the desert proper. But that is many miles from our "ranch," and it forms no part of our immediate landscape.

"Ranch," we call our place, but only as a grand joke. We raise nothing there, and have no intention of doing so. So far as we can control the situation, the native plants and animals have been left unmolested. Even the coyotes are free to thrill us with their maniacal howling at night, often close at hand. Our only "improvements" are a tiny wooden shack, built by my own hands, and a little stone cabin which later took its place as our occasional dwelling.

There is another "improvement," to be sure, which I nearly forgot to mention. We have our own private graveyard, and this not very far from our cabin! However, we are not looking forward to being interred there ourselves. In fact, I fear that we are not even eligible to this privilege. It is an Indian burying-ground, dating back more than fifty years, but still in occasional use. A forlorn little graveyard it is, with an unpainted fence around it, the closely set pickets reinforced with barbed

wire, placed there, I presume, to keep the coyotes from making ghoulish raids upon the sleeping tenants within. The little patch of ground is now more than filled with graves, mostly surmounted by ancient wooden crosses, facing in various directions. From appearances, I suspect that the graves are several layers deep. Once or twice a year, on a church holiday, some of the local Indians gather on our place to conduct a service. And then the little campo santo is made gay with decorations of colored paper. We have watched these ceremonies on several occasions from our cabin, and have even witnessed two actual burials, decidedly lugubrious affairs.

Some years ago, I remarked to one of our Indian neighbors, an intelligent half-breed who speaks good English, that the graveyard seemed to be overcrowded. I told him that we had no objection to its being enlarged a little. "Well," he said, "we have talked about that sometimes, but some of my people have queer ideas about such matters. They think that if the burying-ground is enlarged, more of us will die to fill the empty space." *Natura horret vacuum*, I presume. What happened was this. They did not enlarge the graveyard then. But when the next occasion for an interment arose, they dug the new grave outside the former boundary and then extended the fence around it. A projecting bay was thus added to the contour of the little cemetery, just large enough for the single grave. At present, there are several such bays. If I were the P.D., I should not allow myself to be fooled by a trick like that!

We have no near neighbors, or at least living ones. With a single exception, there is no one living within less than a mile. All of which is as it should be. That is one of the very reasons why we picked out this particular spot. For years our vacations had consisted in camping trips, chiefly in the highlands of Southern California. But suitable camp sites became increasingly difficult to

find. One cannot ordinarily camp upon private property, and on government land, one is generally restricted to definite areas, cleared of brush and provided with all the inconveniences of civilization, including a goodly assortment of near neighbors. There is little of the peace of the wilderness in a village of noisy transients, arriving and departing at all hours of day and night, equipped with radios, dogs, babies and whatever else seems necessary to dispel the terrors of solitude.

And so we looked our county over for a place of our own, as far as possible from a highway or a public campground. Thus it comes about that we now have a city house and a country house! What visions of opulence that statement conjures up, at least to those who do not know our real circumstances. The whole thing was accomplished merely by making some simple transfers between the "necessity" and the "luxury" columns in our budget. Recreation, for example, was placed among the necessities, "smart" apparel and various other supposedly essential marks of gentility among the luxuries.

\* \* \* \* \*

But now our gasoline is rationed, and we can no longer get enough to take us to San Felipe Valley. The same evil men who have destroyed so much of human happiness throughout the world have robbed us of our retreat in the California mountains. However, we are hardly appealing for your sympathy as war casualties on this account!