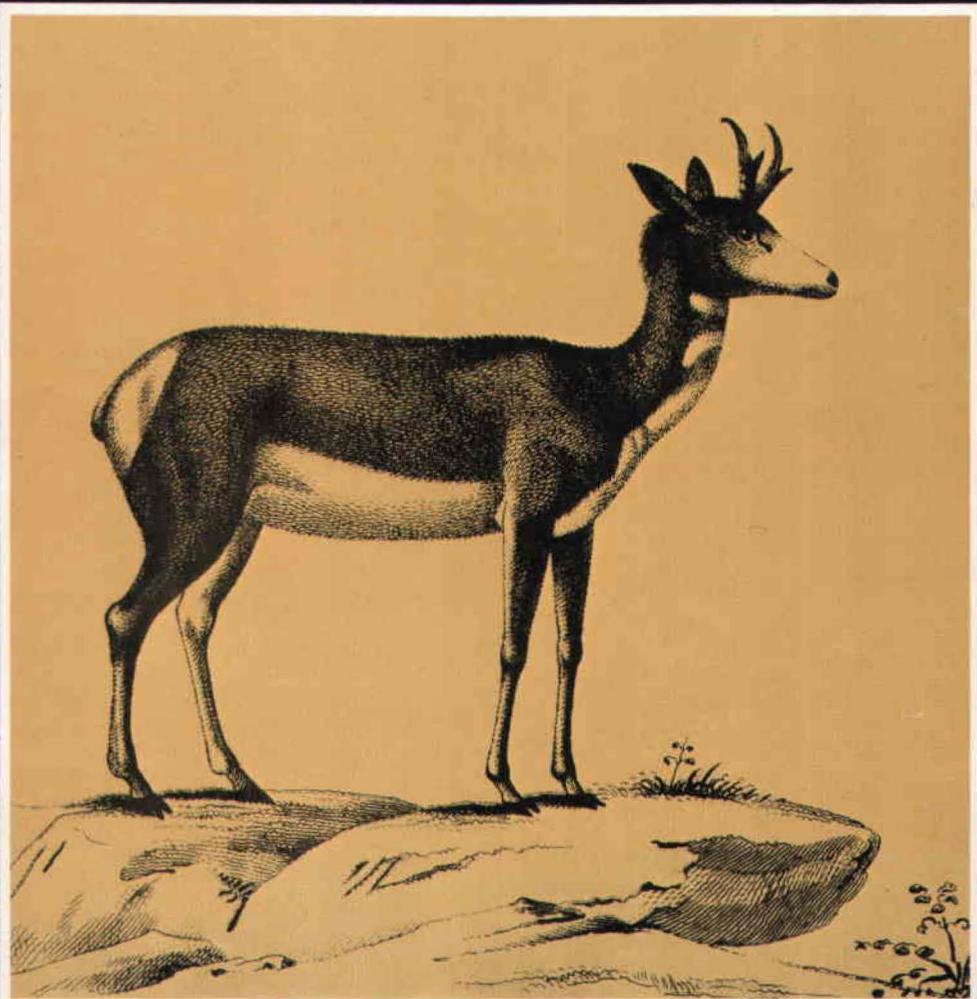


PAUL RUSSELL CUTRIGHT

Meriwether Lewis:
Naturalist



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Meriwether Lewis: Naturalist

by
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Meriwether Lewis, an engraving from the portrait by
Charles Saint-Memin.

Meriwether Lewis: Zoologist

PEOPLE in general do not think of Meriwether Lewis as a zoologist or botanist, or even as a naturalist. On the contrary, mention of his name ordinarily evokes an image of the highly successful explorer, the skilled woodsman and the competent military leader. One scientist at least has characterized him as an engineer.¹ Yet, as Clark was mapmaker, Lewis was zoologist to the expedition. To appreciate him as a student of animals, and an alert observer and reporter of faunal information, one must read the *Original Journals of the Lewis and Clark Expedition* (edited by Reuben Gold Thwaites, 8 volumes, New York, 1904-1905), something all too few individuals have done.

With few exceptions, all of Lewis's descriptions of animals are found in the first five volumes of the *Original Journals*. These contain some 1,900 pages, with Lewis contributing approximately 750. The latter figure would be larger if it were not for three lengthy unexplained hiatuses: from May 13, 1804 to April 7, 1805; from August 27, 1805 through December 31, 1805; and from August 13, 1806 through September 24, 1806, the day the party arrived back in St. Louis.

From the zoological standpoint, one of the most significant features of Lewis's pages is the fact that he devoted about one in every five to animals and referred to some 250 species altogether. There are also 26 descriptions that run to a full page or more and average at least 500 words. The grizzly bear

*Material for "Meriwether Lewis: Zoologist" and for "Meriwether Lewis: Botanist," was assembled while the author was writing his forthcoming book, *Lewis and Clark: Pioneering Naturalists* (University of Illinois Press).

1. Henry W. Setzer, "Zoological Contributions of the Lewis and Clark Expedition," *Journal of the Washington Academy of Sciences*, 44 (November, 1954), 357.

(*Ursus horribilis*) came in for more attention than any other animal, with the buffalo (*Bison bison*) a close second and the beaver (*Castor canadensis*) third.

Perhaps the single ingredient in Lewis's make-up that contributed more than any other to his success as a naturalist was his exceptional power of observation. He had an alert, resourceful, objective mind and, as John Burroughs once said of Theodore Roosevelt, he saw "quickly and surely, not less so with the corporeal eye than with the mental."² He had the rare faculty, too, of seeing the little things so often overlooked by most persons, even trained naturalists, and of focusing on them effortlessly and without forethought. Other prime attributes helpful to him were his innate curiosity and his spontaneous employment of all senses: taste, touch and smell, as well as sight and hearing. Lewis's mind moved rapidly yet, as an observer, he was cautious and rarely jumped to conclusions. He described clearly and effectively what his eyes beheld, and his interest in animals covered a wide spectrum: structure and function, nesting habits and songs of birds, migration, geographical distribution and economic importance of mammals. Lewis, of course, was far superior to others of the party in general and scientific education and therefore, as one observer has written, "better prepared to describe with an approach to scientific exactness the new things found in his new empire."³

This account would be wanting if it did not include verbatim at least one of Lewis's lengthier faunal descriptions. Two weeks after abandoning Fort Clatsop, at a point near Beacon Rock, he discovered the mountain quail (*Oreortyx pictus*) and described it as follows:

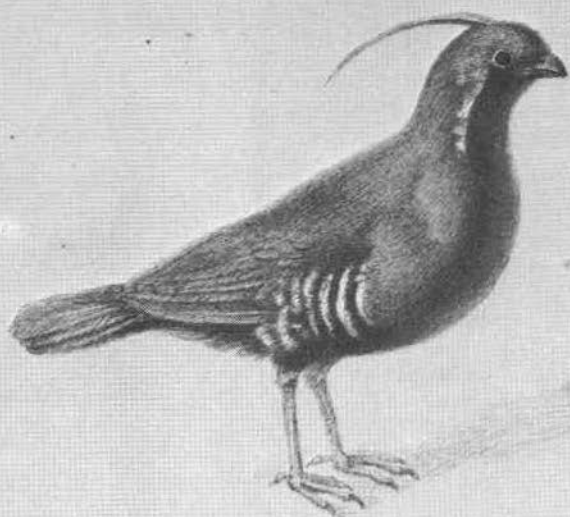
it is reather larger than the quail, or partridge [*viz.*, bobwhite, *Colinus virginianus*] as they are called in Virginia. it's form is precisely that of our partridge tho' it's plumage differs in every part. the upper part of the head, sides and back of the neck, including the crop [*i.e.*, crop] and about 1/3 of the under part of the body is of a bright dove

2. John Burroughs, *Camping and Tramping with Roosevelt* (Houghton Mifflin Co., 1935), 102-103.

3. Elijah Criswell, *Lewis and Clark: Linguistic Pioneers* (University of Missouri studies, Columbia, 1940), Vol. XV, No. 2, xxiii.

coloured blue, underneath the under beak, as high as the lower edge of the eyes, and back as far as hinder part of the eyes and thence coming down to a point in front of the neck about two thirds of it's length downwards, is of a fine dark brick red. between this brick red and the dove colour there runs a narrow stripe of pure white. the ears are covered with some coarse stiff dark brown feathers. just at the base of the under chap [lower beak] there is [a] narrow transverse stripe of white. from the crown of the head two long round feathers extend backwards nearly in the direction of the beak and are of a black colour. the longest of these feathers is two inches and a half, it overlays and conceals the other which is somewhat shorter and seems to be raped in the plumage of that in front which folding backwards collapses behind and has a round appearance. the tail is composed of twelve dark brown feathers of nearly equal length. the large feathers of the wings are of a dark brown and are reather short in proportion to the body of the bird in that respect very similar to our common partridge. the covert of the wings and back are of a dove colour with a slight admixture of redish brown. a wide strip which extends from side to side of the body and occupyes the lower region of the breast is beautifully variagated with the brick red white and black which p[r]edominate in the order they are mentioned and the colours mark the feathers transversely. the legs are covered with feathers as low as the knee; these feathers are of a dark brown tipped with dark brick red as are also those between and about the joining of the legs with the body. they have four toes on each foot of which three are in front and that in the center the longest, those one [on] each side nearly of a length; that behing[d] is also of good length and are all armed with long and strong nails. the legs and feet are white and imbreccated with proportionably large broad scales. the upper beak is short, wide at it's base, black convex, curved downwards and reather obtusely pointed. it exceeds the under chap considerably which is of a white colour, also convex underneath and obtusely pointed. the nostrils are remarkably small, placed far back and low down on the sides of the beak. they are covered by a thin protuberant elastic, black leatherlike substance. the eyes are of a uniform piercing black colour. this is a most beautiful bird. I preserved the skin of this bird retaining the wings feet and head which I hope will give a just idea of the bird. it's loud note is single and consists of a loud squall, intirely different from the whistling of our quales or partridge. it has a cherping note when alarmed something like ours. today there was a second of these birds killed which precisely resembled that just described. I believe these to be the male bird the female, if so, I have not yet seen.⁴

4. Thwaites, *Original Journals of the Lewis and Clark Expedition* (Dodd, Mead & Co., New York, 1904-1905), IV:252-53. Hereafter cited as Thwaites.



Lewis discovered and described the mountain quail on April 7, 1806, above the mouth of the Washougal River, near Beacon Rock. Charles Willson Peale made these sketches of the quail (above) and Lewis's Woodpecker, discovered July 20, 1805, north of Helena, Montana. (Courtesy of American Philosophical Society.)

This description by Lewis is typical of many found in his comprehensive codices, and succeeding scientists, after having read it, have experienced no difficulty whatever with identification. Several months later Lewis delivered the skin of this quail to Peale's Museum in Philadelphia. Soon afterwards—with specimen in hand—Alexander Wilson technically described this bird and Charles Willson Peale made a drawing of it. The drawing still exists (reproduced on p. 8), but the skin, so carefully preserved by Lewis long ago on the lower Columbia, has not survived.

It will be noted that Lewis did not lack for words in describing this hitherto unknown bird. In this and other animal vignettes of his, the writer counted some 60 technical words he used more or less regularly—and correctly. There are a few in the description of the quail, such as "croop," chap, convex, covert and imbricated. Lewis's general literary style, according to Elijah Criswell, was "a grammatically correct, flowing, somewhat artificial and sophisticated eighteenth century style, abounding in elegant language, with some evidence of a grave reserved humor, and now and then a touch of sentimentality."⁵

Only rarely did Lewis employ the Latin words favored by the taxonomist. In his account of the candlefish or eulachon (*Thaleichthys pacificus*) written at Fort Clatsop, he said that it was "of the Malacopterygious Order & Class Clupea."⁶ Elsewhere he stated that the magpie (*Pica pica hudsonia*) belonged to the "*Corvus* genus and order of the pica," a gull to the "*Larus* genus" and a weasel to the "*Mustela* genus." Because binomials dropped from Jefferson's pen as freely as autumn leaves from wind-swept trees, Lewis's obvious reticence on this score is difficult to explain, and more especially so since he was tutored in Latin when a young man.

Occasionally Lewis comes up with a sentence or simile that catches the eye. For instance, in describing Lewis's woodpecker (*Asyndesmus lewis*), he said that its blood red breast had "much the appearance of having been artificially painted or stained of that colour."⁷ The thirteen-lined ground squirrel (*Spermophilus*

5. Criswell, *Lewis and Clark: Linguistic Pioneers*, xix.

6. Thwaites, IV:102-103.

7. Thwaites, V:70. Illustrated on p. 4.

tridecemlineatus pallidus) had spaces between stripes "marked by ranges of pure white circular spots, about the size of brister blue shot."⁸ The forelegs of the western badger (*Taxidea taxus neglecta*) were "formed like [those] of the ternspit dog."⁹ The avocet (*Recurvirostra americana*) had a beak the substance of which was "as flexible as whalebone."¹⁰ And the bellies of some "grey squirrels" encountered near the mouth of the Columbia were "of a redish yellow, or tanners ooze colour."¹¹

Now and then Lewis, like many another ornithologist, attempted to imitate bird songs and cries "by the sound of letters." For example, he reproduced the note of the pinon jay (*Cyanocephalus cyanocephalus*) as "char-âh, char-âh, char-âh," and that of its relative, the black-headed jay (*Cyanocitta stelleri annexens*) as "châ-â, châ-â &c. also twat twat twat."¹² The cry of the poor-will (*Phalaenoptilus nuttallii nuttallii*) did not suggest "poor-will, poor-will" to Lewis, as it did to later bird students, but "at-tah-to'-na' at'tah'to'-na, to-nah."¹³ As to the whistling swan (*Olor columbianus*), he confessed that he could not convey with letters its high-pitched call. "It begins with a kind of whistling sound," he declared, "and terminates in a round full note which is reather louder than the whistling, or former part; this note is as loud as that of the large swan [*i.e.*, the trumpeter swan, *Olor buccinator*]. from the peculiar whistling of the note of this bird I have called it the whistling swan."¹⁴ And whistling swan it is today, more than 160 years later. Another vernacular he applied, namely mule deer, also endures.¹⁵ Still another, "horned lizzard" *should* persist; it has been altered to "horned toad," a sorry misnomer, since the animal (*Phrynosoma douglasii douglasii*) is not a toad but a lizard. In explaining this name, Lewis wrote that "above and

8. Thwaites, II:216.

9. Thwaites, IV:110.

10. Thwaites, VI:133.

11. Thwaites, III:261.

12. Thwaites, II:295-96, VI:135, respectively.

13. Thwaites, VI:132.

14. Thwaites, IV:148.

15. Thwaites, II:21.

behind the eyes there are several projections of the bone which being armed at their extremities with a firm black substance has the appearance of horns sprouting out from the head. this part has induced me to distinguish it by the appellation *horned Lizzard*.”¹⁶

On those rare occasions when Lewis found the nests and eggs of birds, he customarily described them. For example, at the mouth of the Marias River in early June, 1805, he discovered the nest of a white-rumped shrike (*Lanius ludovicianus excubitorides*) with the female sitting on “four eggs of a pale blue colour with small black freckles or dots.”¹⁷ Earlier, between Fort Mandan and the mouth of the Yellowstone, members of the party had found several nests of the wild or Canada goose (*Branta canadensis*), most of which were situated in the tops of broken cottonwood trees. Lewis immediately expressed surprise, for he “had supposed from previous information that they most commonly deposited their eggs” on the ground.¹⁸ Subsequently when ornithologists read Lewis’s statements about these discoveries, they criticised and attempted to discredit them. However, when Elliott Coues visited this same stretch of the Missouri many years later he found Canadian honkers still nesting in cottonwoods, thus confirming Lewis’s reports. “Geese are wise birds which know enough to get out of the way of wolves, foxes and badgers,” Coues explained.¹⁹

Only a few terrestrial mammals migrate, that is, travel annually between regions where they breed and where they spend their winters. In September, 1803, near Marietta, Ohio, while descending the Ohio River on his way to St. Louis, Lewis wrote as follows:

... observed a number of squirrels swimming the Ohio and universally passing from the W. to the East shore they appear to be making to the south; perhaps it may be mast or food which they are in search of but I should rather suppose that it is climate which is their object as I

16. Thwaites, V:80-81.

17. Thwaites, II:141.

18. Thwaites, I:302.

19. Elliott Coues, ed., *History of the Expedition under the Command of Lewis and Clark* (3 vols., Francis P. Harper, New York, 1893), I:270n.

find no difference in the quantity of the mast on both sides of this river it being abundant on both except the beach nut which appears extremely scarce this season. the walnuts and Hickory nuts the usual food of the squirrell appears in great abundance on either side of the river . . . [the squirrels] swim very light on the water and make pretty good speed.²⁰

In those days, before hunting radically reduced their numbers, the gray squirrel (*Sciurus carolinensis*) was much more abundant than now, and its mass migrations a rather common occurrence. They continued up until about a hundred years ago, and the one Lewis witnessed may be regarded as typical. It might be well at this juncture to reread Lewis's account of this event, for we wonder if any of his traveling companions (eleven in all) noted, as he did, that beechnuts were scarce, that walnut and hickory nuts abounded and that the squirrels followed an invariable course from west to east shore, "swam light on the water" and made good speed.

Thirteen months later the expedition was some 1,500 miles up the Missouri, just below the site of present-day Bismarck, North Dakota. Here, on October 17, Lewis reported that "Antelope [*Antilocapra americana*] are passing to the Black mountains [that is, Black Hills] to winter as is their custom."²¹ As other remarks in the *Journals* attest, these slender-limbed graceful creatures were swimming the Missouri, and in an *east to west* direction. Lewis was thus the first white man to witness and record the migration of the pronghorn antelope. Without knowing it, he was also the first to observe migrating buffalo. Each fall this quadruped, in the days of its plenty, traveled from its summer breeding grounds to areas 200 to 300 miles farther south where winters were warmer and less snow covered the grass. Buffalo often used the same route year after year. Recently a long-time resident of Montana pointed out to me where the buffalo customarily crossed the Missouri at Great Falls.

Lewis's observations extended the known range of many animals. On the day the party arrived at the mouth of the

20. Milo M. Quaife, ed., *The Journals of Captain Meriwether Lewis and Sergeant John Ordway* (Wisconsin State Historical Society, Madison, 1916), 42.

21. Thwaites, VI:177. See cover for sketch.

Kansas River they reported a great number of Carolina parrots (*Conuropsis carolinensis*). Before that discovery no one in the East had knowledge of the fact that this lively, part-colored bird inhabited land beyond the wide flow of the Mississippi.²² Far and away the most abundant bird in the world at the time — perhaps of all time — was the passenger pigeon (*Ectopistes migratorius*). Surprisingly, the journalists make no mention of seeing any of these birds until July 13, 1805, at Great Falls, where Lewis, after shooting one, remarked: "They are the same common to the United States, or the wild pigeon as they are called."²³ One year later, on July 5, near present-day Missoula, Montana, Lewis reported "a great number of pigeons breeding in this part of the mountains."²⁴ We can be confident that Lewis made no mistake in his identification because, being well acquainted with the passenger pigeon, he would not have confused it with other birds of somewhat similar appearance, such as the mourning dove (*Zenaidura macroura*). Without this chance observation, no one would know that this bird once nested beyond the Continental Divide. Within little more than a century both parrot and pigeon would become extinct, to join that spectral company which now includes such other North American avians as the great auk (*Pinguinus impennis*), heath hen (*Tympanuchus cupido cupido*) and Labrador duck (*Camptorhynchus labradorius*).

Lewis (with Clark, Ordway and the other journalists) was, of course, the first to provide the world with anything like a true picture of the tremendous abundance of wild game animals then inhabiting the high plains bordering the Missouri. Because of frequent comment he supplied, too, important information on range limits of particular animals. For example, the explorers first encountered buffalo on August 23, 1804, just below present-day Vermilion, Clay County, South Dakota. From there on, this quadruped was common to abundant as far as Gates of the Mountains, Lewis and Clark County, Montana. Soon afterwards, Lewis wrote: "from the appearance of bones and excrement of

22. Thwaites, I:59.

23. Thwaites, II:227.

24. Thwaites, VI:221.

old date the buffaloe sometimes straggle into this valley; but there is no fresh sign of them."²⁵ Lewis would see no more buffalo until his descent of the Sun River, just above Great Falls, almost a year later.

Lewis paid attention to the food habits of many animals. The pack rat (*Neotoma cinerea cinerea*), for example, fed "very much on the fruit and seed of the prickly pear,"²⁶ the badger on "flesh, roots, bugs, and wild fruits;"²⁷ and the black-headed jay "on flesh when they can procure it, also on bugs flies and buries." He did not know whether this jay destroyed smaller birds or not, but its "tallons indicated their capacity to do so if nature has directed it."²⁸ Lewis examined stomach content to obtain at least some of the above information. He definitely performed that operation before reporting that the gizzard of the sage grouse (*Centrocercus urophasianus urophasianus*) was "large and much less compressed and muscular than in most fowls; in short it resembles a maw quite as much as a gizzard."²⁹ He reported, too, that the maw of the grizzly bear was "ten times the size of [that of] the black bear."³⁰

As a document relating to the equipment of the expedition reveals, Lewis carried an "Instrument for measuring made of tape with feet & inches marked on it, confined within a circular leathern box."³¹ He used it often. The ears of a mule deer were 11 inches long and three and a half wide; a bull snake (*Pituophis sayi sayi*) measured five feet two inches from nose to tip of tail; an antelope's "girth of the brest" was two feet two inches; and a jackrabbit (*Lepus townsendii campanius*) made tremendous leaps — by actual measurement 21 feet.³² He did a lot of counting, too, particularly when examining snakes. For example,

25. Thwaites, II:266.

26. Thwaites, II:205.

27. Thwaites, IV:111.

28. Thwaites, VI:135.

29. Thwaites, IV:124.

30. Thwaites, I:372.

31. Thwaites, VII:232.

32. Thwaites, II:20-21, VI:124, 129, and 130, respectively.

a prairie rattler (*Crotalus viridis viridis*) had 176 scuta on its abdomen and 17 half-formed ones on its tail.³³ On occasion he employed a "hand or spiral spring steelyard" of sufficient size for weighing smaller objects. A poor-will (*Phalaenoptilus nuttallii*) for instance, tipped this scale at one ounce and seventeen grains troy, and a badger, the very first encountered, at 16 pounds.³⁴

The poor-will just mentioned came in for additional, and quite special, attention and comment. This bird, Lewis wrote, "appeared to be passing into the dormant state. on the morning of the 18th [October, 1804] the mercurury was at 30 a.o. [above zero] the bird could scarcely move. I run my penknife into it's body under the wing and completely distroyed it's lungs and heart yet it lived upwards to two hours this fanominon I could not account for unless it proceeded from the want of circulation of the blo[o]d."³⁵ Lewis was here, on this date, reporting what was certainly one of the first observed instances of hibernation torpidity in the annals of American ornithological history. Earlier reports of birds hibernating had found their way into print; for instance, in Gilbert White's *The History of Selborne* (1788), but most naturalists then, and for a long time afterwards, while recognizing a dormant period in certain mammals, refused to take seriously claims of a similar phenomenon in birds. Documented proof that it did occur in at least one bird — and that the poor-will — was not forthcoming and accepted as valid until 1946, almost 150 years after Lewis's significant observation.

In typically Jeffersonian manner, Lewis faithfully recorded observations correlating periodic biological phenomena with seasonal data. Clearly he had a keen eye for such things. In April, 1805, he reported that female antelope "are big with young,"³⁶ and in July, that the young wild geese "are not yet feathered nor can they fly. the old geese are in the same

33. Thwaites, II:160-61.

34. Thwaites, VI:132, 128, in order.

35. Thwaites, VI:132.

36. Thwaites, I:351.

situation."³⁷ Later, in September of the same year, the antelope and elk (*Cervus canadensis*) were rutting, and "the Buffalow is nearly ceased the latter Commences the latter end of July or 1st of August."³⁸ In March of 1806, just before the party abandoned Fort Clatsop, he wrote that "The horns of some of the Elk have not yet fallen off, and those of others have shotten out to the length of six inches," and in April, above Celilo Falls, "The curloos [perhaps the long-billed curlew, *Numenius americanus*] are abundant in these plains and are now laying their eggs."³⁹

The writer's regard for Meriwether Lewis, already high, mounted appreciably when he read Lewis's statement of April, 1805, at the junction of the Yellowstone with the Missouri: "altho' game is very abundant and gentle, we only kill as much as is necessary for food."⁴⁰ In those few words Lewis revealed his aversion to needless slaughter of wildlife. For many days the party had been surrounded by buffalo, antelope, deer and other animals in such numbers that, as Lewis said, the hunters could easily have supplied enough food for a regiment. Under these circumstances, the rank and file of the Corps, each with a rifle in hand and moving targets everywhere, would doubtless have been guilty of excessive wanton killing if Lewis had not laid down the law disallowing it. By way of contrast is the remark of John Bradbury, the English naturalist who, six years later, followed Lewis and Clark up the Missouri. "It is impossible to restrain the hunters," he declared, "as they scarcely ever lose an opportunity of killing, if it offers, even although not in want of food."⁴¹

Since Lewis was conversant with Jefferson's intense interest in paleontology and his collection of fossils on display in the East Room of the White House, it is not surprising that, on his descent of the Ohio in 1803, he visited Big Bone Lick near

37. Thwaites, VI:174.

38. Thwaites, VI:175.

39. Thwaites, IV:163, 320.

40. Thwaites, I:345.

41. John Bradbury, *Travels in the Interior of America*, in R. G. Thwaites, ed., *Early Western Travels* (Arthur H. Clark Co., Cleveland, 1904-1906), V:148.

Cincinnati where a Dr. William Goforth had discovered a large deposit of petrified remains. Before leaving the site, Lewis collected several specimens and, on his return to Cincinnati, consigned a boxfull to Jefferson. Unhappily, they seem to have been lost in transit.⁴² In his ascent of the Missouri the following year, Lewis collected additional fossil specimens, some of which at least, ultimately reached the American Philosophical Society in Philadelphia. The Donation Book for that organization listing minerals received from Lewis on November 16, 1805 includes "Petrefaction on the Missouri, May 30, 1804" and "Petrified Jawbone of a fish or some other animal found . . . 6 Aug. 1804."⁴³ So Lewis was interested in animals of the past as well as those of the present.

As to Lewis's almost daily use of his senses in the observation of animals, a number of illustrations of his exceptional sight and hearing have already been cited. His sense of taste revealed itself most often when sampling new forms of food. For instance, "the flesh of the beaver is esteemed a delicacy among us; I think the tale a most delicious morsal, when boiled it resembles in flavor the tongues and sounds [*i.e.*, swim-bladders] of the codfish."⁴⁴ Porcupine meat, too, was "pleasant and whoalsome," and prairie dog, when roasted by way of experiment, "well flavored and tender."⁴⁵ Also, as all students of the expedition know, Lewis liked dog meat whereas Clark could not tolerate it.

Lewis proved that his sense of smell was in no way inferior when he climbed cliffs of the "White Rocks" region of the Missouri to the homes of the bighorn (*Ovis canadensis auduboni*). "The sides of the clifts where these anamals resort much to lodg," he reported, "have the peculiar smell of the sheep-folds."⁴⁶ He was sensitive to touch, as well. After feeling the fur

42. Lewis may have retained some of these specimens for, in the Donation Book of the American Philosophical Society listing minerals received by the Society from Lewis by way of Jefferson (Nov. 16, 1805) is the statement: "39. Petrefactions obtained on the River Ohio in 1803."

43. Thwaites, VI:159-60.

44. Thwaites, I:360.

45. Thwaites, VI:129, II:124.

46. Thwaites, II:103.

of the sea otter (*Enhydra lutris nereis*), he declared: "it is the riches[t] and I think the most delicious fur in the world at least I cannot form an idea of any more so. it is deep thick silky in the extreem and strong."⁴⁷

Lewis continuously demonstrated his competence in observing the little things so often passed over without notice by most persons. Examples could be cited almost endlessly. Soon after leaving Fort Mandan, he wrote: "We have frequently seen the wolves [plains gray wolf, *Canis lupus nubilus*] in pursuit of the Antelope in the plains; they appear to decoy a single one from a flock, and then pursue, alternately relieving each other untill they take it."⁴⁸ On his ascent of the Marias River in the summer of 1806, he noted that the only water present out on the plains was to be found in small concavities such as buffalo wallows, and that this water was so strongly impregnated with alkali that he and his men could not use it. However, he declared, the buffalo "appear to prefer this water to that of the river."⁴⁹

When Lewis first encountered the magpie, in mid-September, 1804, near present-day Chamberlain, South Dakota, he observed that "This bird does not spread it's tail when it flies."⁵⁰ At a later date, watching an avocet feeding, he said "it immerces it's beak in the water, and th[r]ows it's head and beak from side to side at every step it takes."⁵¹

Again, while near the North Dakota-Montana line, he compared the habits of the mule deer (*Dama hemionus hemionus*) with those of the white-tail (*Dama virginianus*). The former he found rarely, he asserted, "in any except of rough country; they prefer the open grounds and are seldom found in the woodlands near the river; when they are met with in the woodlands or river bottoms and are closely pursued, the[y] invariably run to the hills or open country as the Elk do. the contrary happens with the common [white-tail] deer."⁵² Also (and here

47. Thwaites, IV:99.

48. Thwaites, I:351.

49. Thwaites, V:211.

50. Thwaites, VI:131.

51. Thwaites, VI:133.

52. Thwaites, II:20.

we note a particularly good example of Lewis's close attention to anatomical detail), the mule deer had a patch of long hair growing on the outer sides of the first joints of the hind legs which occupied six to eight inches but, in the white-tail, not more than two.⁵³

From first to last Lewis had opportunity to examine many grizzly bears, hardly any two of which were colored the same. Their coats ranged from near white, to gray, "redish brown or bey" and "jut black." Thus he was faced with the question as to whether these represented just one species or more than one. He did not express himself until the spring of 1806 at Camp Chopunnish, by which time the evidence seemed clear. Here the hunters were active and brought in a number of grizzlies. "These bear," he declared, "gave me a stronger evidence of the various coloured bear of this country being one speceis only, than any I have heretofore had . . . if we were to attempt to distinguish them by their collours and to denominate each colour a distinct speceis we should soon find at least twenty."⁵⁴

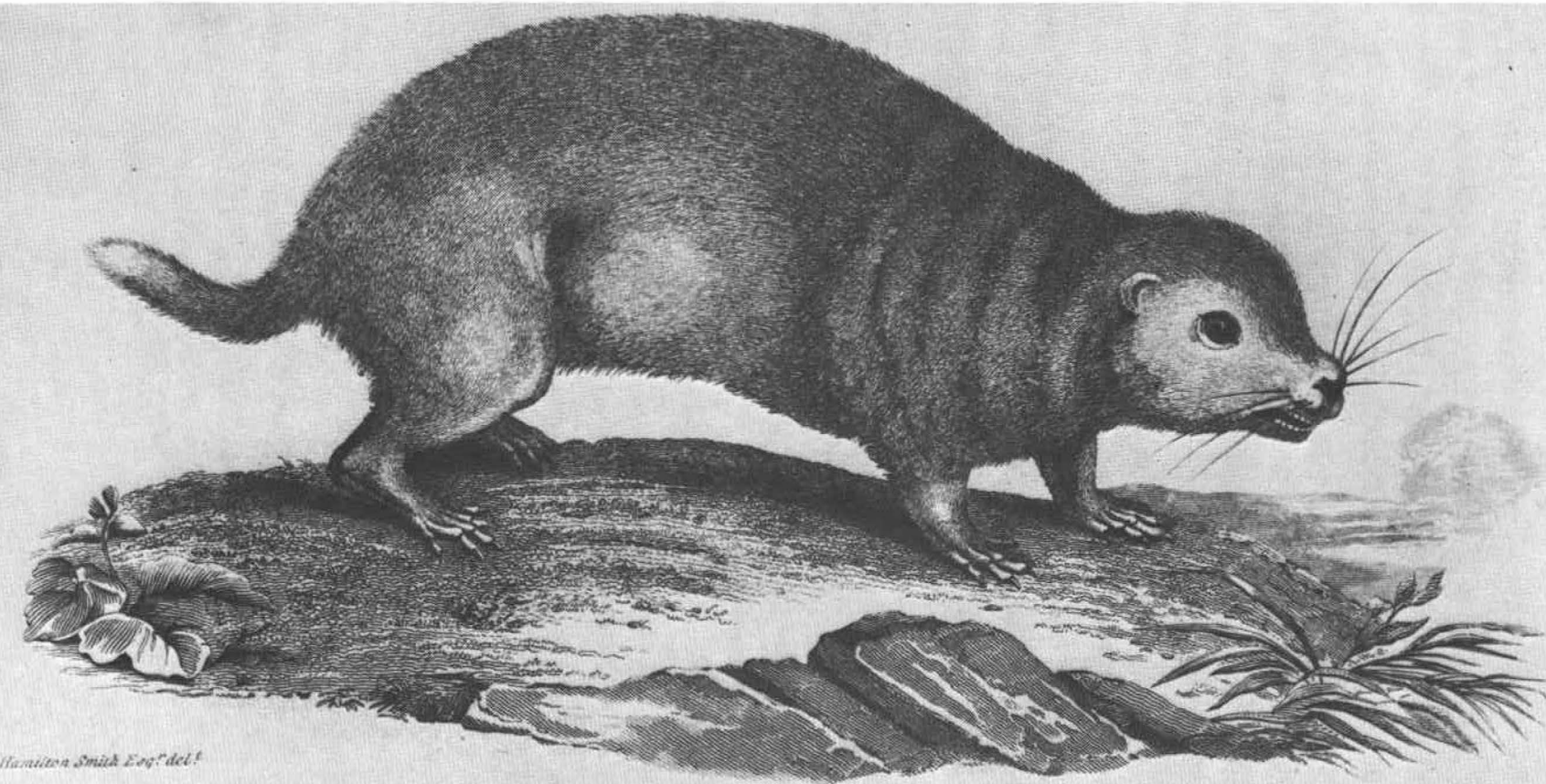
At the mouth of the Marias in June, 1805, Lewis wrote: "the bee martin or *Kingbird* [*Tyrannus tyrannus*] is common to this country; tho' there are no bees . . . nor have we met with a honey bee since we passed the entrance of the Osage River."⁵⁵ The honey bee (*Apis mellifera*) was not native to the United States; it was brought here by the early colonists. As their descendants moved west, the bee followed in their wake. Thus Lewis noted not only animals present but, also, animals absent.

Some observations on the prairie dog (*Cynomys ludovicianus ludovicianus*) serve as concluding examples of Meriwether Lewis's genius at noting small details. After he had the opportunity of visiting a number of prairie dog towns, he wrote that these animals "seelect a south or a south Easterly exposure for their residences." More importantly, these same rodents never visited the brooks or rivers for water. As he expressed it: "I am astonished how this anamal exists as it does without water,

53. Thwaites, II:21.

54. Thwaites, V:37-38.

55. Thwaites, II:141.



Hamilton Smith Esq. del.

THE PRAIRIE MARMOT.

ARCTOMYS ? Ludoviciani.

particularly in a country like this where there is scarcely any rain during $\frac{3}{4}$ of the year and more rarely any dew [dew]; yet we have sometimes found their villages at the distance of five or six miles from any water, and they are never found out of the limits of the ground which their burrows occupy; in the Autumn when the hard frosts commence they close their burrows and do not venture out again untill spring."⁵⁶

George Catlin was one of the first to speculate on how the prairie dog lived without visiting creeks or rivers. He thought they must obtain their water from dew on the grass, or sink "wells from their underground habitations, by which they descend low enough to get their supply."⁵⁷ It is now well-known, of course, that quite a number of arid land rodents, such as kangaroo rats (*Dipodomys* spp.) and pocket mice (*Perognathus* spp.) in addition to prairie dogs, can live out their life spans in good health on a diet of nothing but dry plant food in which the water content does not exceed five to ten percent. That these animals, comprising a group of unusual physiological plasticity, survive on such a diet is due to their ability to obtain necessary water from their food and to retain most of it through emission of a highly-concentrated urine, the concentration made possible by a greater resorptive activity of kidneys and urinary bladder than is true in most mammals. It would appear that Lewis was the first to observe and report this unique phenomenon of water conservation in North American rodents.

Lewis rounded out his activities as zoologist by collecting and preserving specimens. While still in St. Louis he shipped a horned toad to Jefferson. After the expedition got underway, he preserved the first animal material (at least the first referred to in any of the journals) on July 30, 1804, near present-day Fort Calhoun, Nebraska. On that date, after Private Joseph Field killed a badger, Sergeant John Ordway wrote: "Capt Lewis had this animal Skined [and] the Skin Stuffed in order to send back to St. Louis."⁵⁸ With the arrival of the party on the high plains soon afterwards, where they discovered several animals then

56. Thwaites, II:63-64.

57. George Catlin, *North American Indians* (2 vols., Leary, Stuart & Co., Philadelphia, 1913), I:88.

58. Quaife, *Journals of Lewis and Ordway*, 103.

unknown to science such as antelope, mule deer, prairie dog, white-tailed jackrabbit and coyote (*Canis latrans*), Lewis added substantially to his collection, so that the following spring he consigned to Jefferson skins, bones and horns of a least 17 or 18 different animals. In an audacious move, he shipped, too, six live animals: a prairie dog, a prairie sharp-tailed grouse (*Pedioecetes phasianellus campestris*) and four magpies. After enduring a journey of seven months and some 4,000 miles, under most trying conditions, the prairie dog and one of the magpies survived to reach Peale's Museum.

Since no invoice exists of zoological specimens accumulated from Fort Mandan to the Pacific and return, we will never be able to state the exact size and composition of that collection. It could not have been appreciably large, for the weight and bulkiness of bones and skins would have precluded it. If Lewis and Clark had found a U. S. trading vessel anchored in the Columbia estuary, they would doubtless have entrusted to it a much larger collection of animal material than they themselves in small dugouts were able to bring back. However, we know that Peale's Museum later accessioned skins of such birds as the mountain quail, western tanager (*Piranga ludoviciana*), Lewis's woodpecker and Clark's nutcracker (*Nucifraga columbiana*) and bones, horns and hides of various mammals, among them the pack rat, mountain beaver (*Aplodontia rufa rufa*) and Columbian ground squirrel (*Spermophilus columbianus columbianus*). Within the next few years, on the basis of this material, Alexander Wilson, George Ord and Constantine Samuel Rafinesque would technically describe and name all of these animals. These men thus received the honor that would have been Lewis's except for his untimely death.

Fate has dealt harshly with the animal specimens returned by Lewis and Clark. To my knowledge, only four attributed to the expedition are extant, and two of these are suspect. A single mountain goat (*Oreamnos americanus*) horn in the Filson Club, Louisville, Kentucky, and a pair of elk antlers hanging at Monticello would seem to be valid. However, moose antlers at Monticello may be questioned on the grounds that Lewis and Clark did not report a single moose killed on their journey. A skin of Lewis's woodpecker in the Museum of

Comparative Zoology, Harvard University, is probably a relic of the expedition but, for lack of any record, positive confirmation is lacking.

Lewis discovered more than 100 animals then new to science. How many people know that he discovered, among fish, the white sturgeon (*Acipenser transmontanus*), cutthroat trout (*Salmo clarkii*) and steelhead trout (*Salmo gairdneri*); among reptiles, the prairie rattlesnake and horned toad; among birds, the sage grouse, pinon jay, whistling swan, Nuttall's poor-will, western tanager and western meadowlark (*Sturnella magna neglecta*); and among mammals, the pronghorn antelope, coyote, mule deer, Columbian black-tailed deer (*Dama hemionus columbianus*), Oregon bobcat (*Lynx rufus fasciatus*), pack rat and grizzly bear?

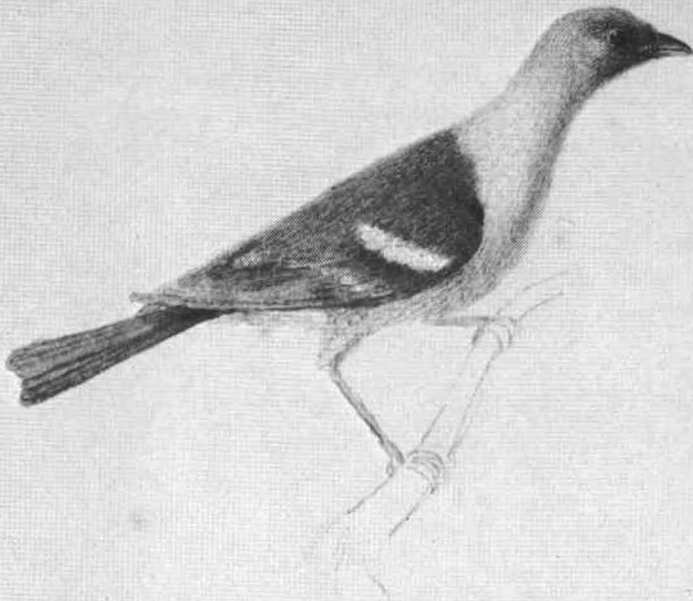
* * *

Early in the year 1803, after Jefferson had obtained authority from Congress to send a party of men to the Western Ocean, he wrote Dr. Benjamin Rush that Lewis, who would lead the party, possessed "a great mass of accurate observation on all the subjects of nature which present themselves here, & will therefore readily select those only in his new route which shall be new."⁵⁹ At a later date the President complimented Lewis still further by stressing his "talent for observation which had led him to an accurate knowledge of the plants and animals of his own country."⁶⁰ These statements make clear Jefferson's high opinion of Lewis as a naturalist, and doubtless explain why he made no particular effort to find a more experienced naturalist to join the expedition.

Jefferson did not, however, here or elsewhere, throw particular light on how Lewis had acquired his knowledge of animals. Of two primary sources, surely the first was his self-schooling as boy and young man in woods and fields. That he possessed an inborn curiosity about the wild creatures inhabiting the environment which surrounded him, and that he became intimately acquainted with them, is borne out again and again by journalistic entries in which he compares western with

59. Thwaites, VII:211.

60. Coues, *History of Expedition under Lewis and Clark*, I:xviii.



Charles Willson Peale's drawing of the "Louisiana" (now western) tanager, discovered and described by Meriwether Lewis, June 6, 1806, at Camp Chopunnish on Clearwater River, Idaho. (Courtesy American Philosophical Society.)

eastern forms. For instance, when describing the western tanager, he said: "The beak is reather more than half an inch in length and is formed much [like that] of the virginia nightingale [the cardinal, *Richmondena cardinalis*]." ⁶¹ In writing of the cutthroat trout, he remarked: "These trout . . . precisely resemble our mountain or speckled trout [*Salvelinus fontinalis*] in form and the position of their fins, but the specks on these are of a deep black instead of the red or goald . . . [and these fish] have generally a small dash of red on each side behind the front ventral fin." ⁶² He noted, too, that the prairie rattlers "do not differ in their colours from the rattle-snake common to the middle

61. Thwaites, V:111-12.

62. Thwaites, II:150-51.

atlantic states [the timber rattler, *Crotalus horridus*], but [do differ] considerably in the form and figure of these colours."⁶³ Yet one more measure of Lewis's familiarity with eastern animals is his statement that the tail feathers of the dusky grouse (*Dendragapus obscurus*) numbered the same as those of the eastern ruffed grouse (*Bonasa umbellus umbellus*), namely eighteen.⁶⁴ It is highly unlikely that many other persons of that day if queried about the precise number of feathers in the tail of the ruffed grouse could have supplied the answer.

The second essential source of Lewis's "accurate knowledge" was the instruction provided by the President. As Jefferson's private secretary, Lewis lived in the White House (known simply as the President's Mansion until after it was burned by the British in 1814 and painted white to cover the scars) for more than two years. He assumed his duties in early April, 1801, and continued them until his departure for the land of high plains and prairie dog towns on July 5, 1803. It is now generally conceded that Jefferson had sought Lewis's presence in the nation's capital that he might supervise his preparation for the onerous task of leading the first government-sponsored scientific expedition to the West. As to Jefferson's standing as a scientist among his contemporaries, and hence his competence to serve as Lewis's instructor, we have Dr. Barton's word for it that "in the various departments of . . . botany and in zoology, the information of this gentleman is equalled by that of few persons in the United States."⁶⁵

We can only speculate as to the directions Jefferson's training of Lewis took, but can be confident that he did not neglect zoology and botany. As the most eminent bibliophile of his day, and owner of one of the largest private libraries in the country,⁶⁶ he had biological (as well as geographical, mineralogical and medical) tools at hand. Among them were Mark Catesby's and

63. Thwaites, II:160-61.

64. Thwaites, II:295.

65. Edwin Morris Betts, ed., *Thomas Jefferson's Garden Book* (American Philosophical Society, Philadelphia, 1944), 172.

66. This was the second of three libraries owned during his life, and the one subsequently presented to Library of Congress.

William Bairtram's travels to the Carolinas, Georgia and Florida and Carl Linnaeus's taxonomic tomes. There is much to indicate that Jefferson recommended the last-mentioned to the close attention of his youthful amanuensis. As Donald Jackson has said, Lewis's later descriptions of western animals "are Linnaean; he mentions Linnaean class, genus and species name; he discusses his specimens with a proficiency that could only come from ready access to a work in zoology. If he does not have with him the portion of Linnaeus's *Systema Naturae* dealing with zoology, he must have one or more derived from it."⁶⁷ (It is definitely known that he did carry with him two Linnaean volumes on botany.) He probably had with him, too, *A New and Complete Dictionary of Arts and Sciences* (4 volumes, 2nd edition, London, 1764-1765), commonly called Owen's *Dictionary* after the publisher. Most if not all the few generic and other taxonomic words used by Lewis in describing animals are to be found in this work.⁶⁸

We may further surmise that Jefferson, who was a methodical man as well as perennial student, outlined a specific course of study for his protege and insisted that he adhere to it punctiliously. If so, it becomes easier to comprehend the technical quality of Lewis's later descriptions of animals. Even if he did not, it is inescapable that much of Jefferson's enthusiasm rubbed off on him, an enthusiasm demonstrated by an active participation in the introduction of beneficial plants into his country, his attempts to correlate seasonal data with periodic biological phenomena, his insistence that all transmitted specimens, whether plants or animals, be properly labeled for easy identification, his continual absorption with note-taking on natural history themes, his whole-hearted espousal of binomial nomenclature and his deep-rooted interest in paleontology as witnessed by his collection of petrified bones which he kept and displayed in the East Room of the White House. Lewis, too, may have learned the rudiments of taxonomy from Jefferson. In the

67. Donald Jackson, "Some Books Carried by Lewis and Clark," *Missouri Historical Society Bulletin*, XVI (October, 1959), 6.

68. See Thwaites, VI:280, wherein is reproduced a memorandum left by Clark referring to "The 4 vols. of Deckinsery [Dictionary] of arts an[d] sciences" which are to be forwarded (1806) from St. Louis to Louisville.

latter's *Garden Book* may be found his method for preparing a bird skin:

Make a small incision between the legs of the bird; take out the entrails & eyes, wipe the inside & with a quill force a passage through the throat into the body that the ingredients may find a way into the stomach & so pass off through the mouth. fill the bird with a composition of $\frac{2}{3}$ common salt & $\frac{1}{3}$ nitre [sodium nitrate or saltpeter] pounded in a mortar with two tablespoonfuls of black or Indian pepper to a pound. hang it up by it's legs 8 or 10 weeks, & if the bird be small it will be sufficiently preserved in that time. if it be large, the process is the same, but greater attention will be necessary.⁶⁹

Some students of the expedition have maintained that Lewis, during his stay in Philadelphia just before starting west, obtained much important biological training and information from such learned scientists as Drs. Barton and Wistar. But Lewis's stay was all too brief for that — no more than four or five weeks — and furthermore he was too deeply involved in his primary mission which was to outfit the expedition. It is a matter of record that Robert Patterson instructed him in the use of sextant and chronometer, that Dr. Wistar discussed fossils with him, that Dr. Benjamin Rush provided a list of questions calculated to guide him in studying Indian mores and that Dr. Barton loaned him a copy of Antoine Du Pratz's *History of Louisiana*, but there is no evidence known to the writer to support any claim that Lewis's knowledge of animals (or plants) was appreciably extended during this visit.

Elliott Coues and others have criticised Thomas Jefferson for not sending "a trained naturalist" with the expedition. Actually, trained naturalists did not exist in America at that time — trained, that is, in the sense that they had pursued a course of study in college or university to prepare for that specialization. Many of the naturalists (or natural philosophers as they were often called) of that day, men like Benjamin Smith Barton, Caspar Wistar, Thomas Jefferson and Henry Muhlenberg, had been formally educated, but as physicians, lawyers and preachers of the gospel. Their genuine, enthusiastic preoccupation with animals, plants and other objects of nature was

69. Betts, *Thomas Jefferson's Garden Book*, 95.

purely avocational. Others, though professional men, had experienced no academic preparation whatever; for example, Alexander Wilson was a weaver by training, Thomas Nuttall a printer, Constantine Samuel Rafinesque a merchant, George Ord a ship's chandler, Thomas Say a pharmacist and John Bartram a farmer. All of these men had gained their knowledge of fauna and flora through their own efforts or from instruction provided gratuitously by other self-taught individuals with like interests. If any of them had a biological edge on Lewis it came through the benefit of added years of experience and a greater familiarity with scientific nomenclature and not from any formal training.

In the context of the times, Meriwether Lewis was a surprisingly competent zoologist, with an objective, systematic approach that set a pattern for future naturalists. The abounding zoological data in Lewis's journals — a meager portion of which I have recorded above—eloquently supports Jefferson's decision to entrust this important phase of the expedition's work to him.

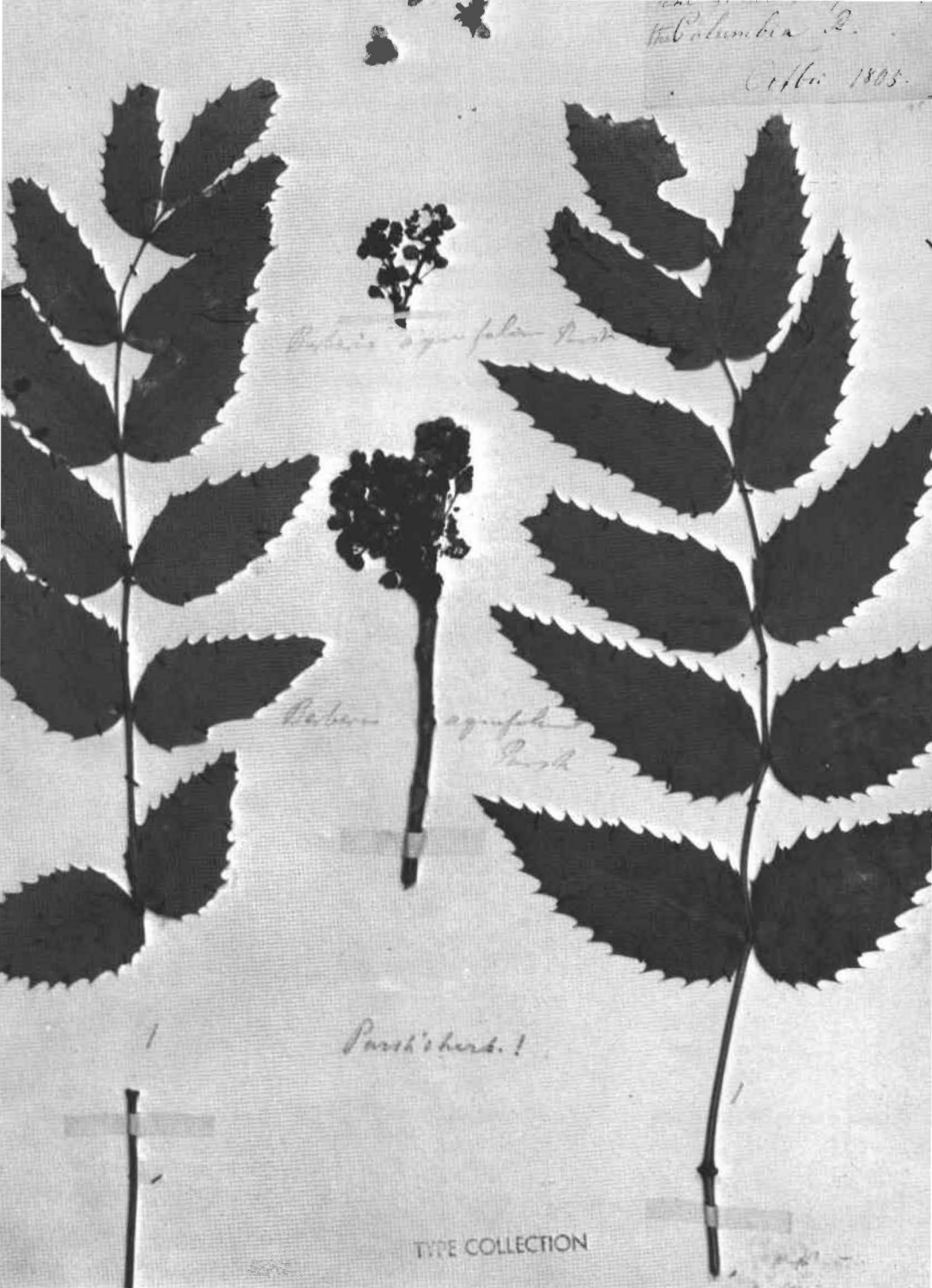
Meriwether Lewis: Botanist

DURING their protracted crossing of the North American continent, Lewis and Clark passed through and became familiar with a remarkable variety and number of climatic plant formations or communities. In the beginning, they were enveloped by a great deciduous forest composed of lofty oak, maple, walnut, hickory and sycamore. In due time they came to the high plains (grasslands), vacant of all trees except a few cottonwoods, willow and ash restricted to river banks. As they began their transit of the Rockies, they entered a green coniferous world of spruce, fir, pine and cedar, this persisting until they dropped down into the arid, treeless country of the interior basin. Finally, nearing the Pacific Coast, they entered another green world, the most important coniferous forest in our land, with mighty trees, far larger than any of the explorers had ever seen before.

For most of the journey to the Pacific and return, Lewis kept what amounts to a running commentary on the plant life. What he had to say about the botany of a small segment of the trip, that of the high plains from Fort Mandan to the mouth of the Yellowstone River, may be taken as typical. The country on both sides of the Missouri, Lewis wrote, was "one continued level fertile plain as far as the eye can reach, in which there is not even a solitary tree or shrub to be seen."¹ This flat prairie-land, he added, was "generally covered with a short grass resembling very much the blue grass."² Bordering the river and on islands were such trees as cottonwood, box elder, willow, ash and elm, and a dense undergrowth of wild rose, honeysuckle,

1. Reuben Gold Thwaites, ed., *Original Journals of the Lewis and Clark Expedition* (Dodd, Mead & Co., New York, 1904-1905), I:292. Hereafter cited as Thwaites.

2. Thwaites, I:307.



Oregon Grape (*Berberis nervosa*) collected by Lewis October, 1805, below Celilo Falls. (Academy of Natural Sciences of Philadelphia.)

gooseberry, currant and serviceberry. On the bluffs between benchland and river grew clumps of dwarf cedar and quantities of sagebrush.³

Because Lewis methodically kept track of the flora across the continent, he was able to extend the geographical range of many plants heretofore unknown except in the East. For example, no one until then knew that the box elder or ash-leaved maple (*Acer negundo*), common east of the Mississippi, followed the Missouri to the foothills of the Rockies; and the familiar cattail (*Typha latifolia*) and broad-leaved arrowhead or wapato (*Sagittaria latifolia*) both put down roots in soil bordering the Columbia estuary as well as in that of marshlands in eastern states.

Now and then Lewis provided useful information on the ecological range of a plant (that is, the particular kind of environment it required). The arrowhead of the West, for instance, restricted itself to the marshy grounds along the Columbia "commencing just above the Quicksand River [today's Sandy], and extending downwards for about 70 miles."⁴ Describing the environment preferred by the camas (*Camassia quamash*), the root of which was so much eaten by Pacific Northwest Indians, Lewis said: "We have never met with this plant but in or adjacent to a piny or fir timbered country, and there always in the open grounds and glades . . . it delights in a black rich moist soil, and even grows most luxuriantly where the land remains from 6 to nine inches under water untill the seed are nearly perfect . . ." He observed, too, that near the Pacific this same plant grew in small quantities and was inferior in size to that on the Weippe Prairie of Idaho.⁵

Lewis, of course, described many plants in great detail. Because these descriptions reveal much about his botanical and delineative capabilities, and because they may be found only in Thwaites' *Original Journals of the Lewis and Clark Expedition*, the writer feels that at least one of them should be reproduced word for word as Lewis wrote it. Chosen for that purpose is his account of the lovely ragged robin (*Clarkia pulchella*),

3. Thwaites, I:337-38.

4. Thwaites, IV:10.

5. Thwaites, V:124.



Original drawing of ragged robin (*Clarkia pulchella*), from *Flora Americae Septentrionalis* by Frederick Pursh. Specimen in Academy of Natural Sciences of Philadelphia collected June 1, 1806, at Camp Chopunnish on Clearwater River, near Kamiah, Idaho.

one of the most celebrated plants associated with the expedition, which Lewis discovered and described June 1, 1806, while encamped on the Clearwater River, Idaho:

I met with a singular plant today in blume of which I preserved a specimine; it grows on the steep sides of the fertile hills near this place, the radix is fibrous, not much branched, annual, woody, white and nearly smooth. the stem is simple branching ascending [2-1/2 feet high.] celindric, villose and of a pale red colour. the branches are but few and those near it's upper extremity. the extremities of the branches are flexible and are bent downward near their extremities with the weight of the flowers. the leaf is sessile, scattered thinly, nearly linear tho' somewhat widest in the middle, two inches in length, absolutely entire, villose, obtusely pointed and of an ordinary green. above each leaf a small short branch protrudes, supporting a tissue of four or five smaller leaves of the same appearance with those discribed. a leaf is placed underneath ea[c]h branch, and each flower. the calyx is a one flowered spathe. the corolla superior consists of four pale perple petals which are tripartite, the central lobe largest and all terminate obtusely; they are inserted with a long and narrow claw on the top of the germ, are long, smooth, & deciduous. there are two distinct sets of stamens the 1st or principal consists of four, the filaments of which are capillary, erect, inserted on the top of the germ alternately with the petals, equal, short, membranous; the anthers are also four each being elivated with it's fillament, they are linear and reather flat, erect, sessile, cohering at the base, membranous, longitudinally furrowed, twice as long as the fillament naked, and of a pale perple colour. the second set of stamens are very minute are also four and placed within and opposite to the petals, these are scarcely persceptable while the 1st are large and conspicuous; the fillaments are capillary equal, very short, white and smooth. the anthers are four, oblong, beaked, erect, cohering at the base, membranous, shorter than the fillaments, white naked and appear not to form pollen, there is one pistillum; the germ of which is also one, cilindric, villous, inferior, sessile, as long as the 1st stamens & marked with 8 longitudinal furrows. the single style and stigma form a perfect monapetalous corolla only with this difference, that the style which elivates the stigma or limb is not a tube but solid tho' it's outer appearance is that of the tube of a monopetalous corolla swelling as it ascends and gliding in such a manner into the limb that it cannot be said where the style ends, or the stigma begins; jointly they are as long as the corolla, white, the limb is four cleft, sauser shaped, and the margins of the lobes entire and rounded. this has the appearance of a monopetalous flower growing from the center of a four petalled corollar, which is rendered more conspicuous in consequence of the 1st being white and the latter of a pale perple. I regret very much that the

seed of this plant are not yet ripe and it is probable will not be so during my residence in this neighbourhood.⁶

Lewis's description of this plant is positive evidence of what he could do graphically with root, stem, leaf and flower in one hand and pen in the other. In this account alone, he employed more than 30 technical botanical terms—villose, sessile, spathe, stigma and monopetalous among them—from a reservoir of more than 150 he used altogether in his expansive, hand-written codices. Only a Latin binomial is missing. For that, the world had to wait until 1814, when the German naturalist, Frederick Pursh, produced it.

Lewis rarely employed the Latin-derived taxonomical botanical word. However, he declared Arikara tobacco (*Nicotiana quadrivalvis*) to be of the order "*pentandria monoginia*," and a "green bryer" (*Rubus macropetalus*) to be of "the class Polyandria and order Polygynia."⁷ Only once, so far as the writer has found, did he exhibit a full-fledged binomial, and that on March 31, 1806, when writing about the broad-leaved arrowhead. "The *Sagittaria Sagittifolia*," he said, "does not grow on this river above the Columbian valley."⁸ Lewis's almost total disregard of Linnaean nomenclature is difficult to understand. Latin was not entirely foreign to him since, as a young man, he had received instruction in that subject and, during his two years in the White House, he had lived with Thomas Jefferson who, when referring to animals and plants, tended to use the scientific name quite as often as the vernacular.

In his attention to western plants, Lewis sought dimensions of plants just as he did of animals. He was, of course, much impressed with the height and circumference of the huge conifers comprising forests west of the Cascade Range. For example, the Sitka spruce (*Picea sitchensis*), he said, "grows to immense size . . . in several instances we have found them as much as 36 feet in the girth or 12 feet diameter perfectly solid and entire. they frequently rise to the hight of 230 feet, and one hundred and twenty or 30 of that hight without a limb."⁹ At

6. Thwaites, V:95-97.

7. Thwaites, VI:150; IV:256.

8. Thwaites, IV:223.

9. Thwaites, IV:41.

the same time he measured maximal features, he applied tapeline to minimal. The needles of the Douglas fir (*Pseudotsuga taxifolia*), for instance, were one inch long and 1/20th wide and those of the grand fir (*Abies grandis*) one and 1/8th of an inch long and 1/16th wide. Previously he had never encountered a maple with such large leaves as those of the broad-leaved maple (*Acer macrophyllum*) which he discovered growing along the lower reaches of the Columbia. Writing at Fort Clatsop, he said, "the leaf [is] 8 inches in length and 12 in breadth."¹⁰ Not long ago, at the Academy of Natural Sciences of Philadelphia, the writer had the opportunity of measuring a leaf of this tree collected by Lewis on April 10, 1806, at the Upper Cascades of the Columbia. It was precisely 8 inches long and 12 wide.

Fully conversant with Jefferson's efforts to introduce the olive, dry rice and other useful Old World plants into the United States, Lewis quite understandably paid particular attention to trans-Mississippi herbs and shrubs that might one day be grown successfully and profitably in eastern gardens. For example, when he discovered a species of currant near Gates of the Mountains, he reported that it had such a flavorful fruit that he was confident it "would be preferred at our markets to any currant now cultivated in the U. States."¹¹ The shrubby cedar (*Juniperus sabina procumbens*) found adorning Missouri bluffs would, he thought, "make very handsome edgings to the borders and walks of a garden; it is quite as handsome as box [boxwood, *Buxus sempervirens*] and would be much more easily propagated."¹² On discovering near Three Forks a species of flax (Lewis's wild flax, *Linum lewisii*), he declared: "The bark of the stem is thick strong, and appears as if it would make excellent flax. . . . if it should on experiment prove to yield good flax and at the same time admit of being cut without injury [to] the perennial root it will be a most valuable plant . . ."¹³ A wild onion (possibly *Allium cernuum*), also found near Three Forks, seemed to him "to be a valuable plant inasmuch as it produces

10. Thwaites, IV:57.

11. Thwaites, II:251.

12. Thwaites, I:299.

13. Thwaites, II:244.



Lewisia lewisii
Pursh
L. 1806

Perennial Flax.
Valleys of the Rocky
mountains.
July 9th 1806.

Lewis's wild flax collected near Great Falls, Montana, on July 9, 1806.
Academy of Natural Sciences of Philadelphia.

a large quantity to the squar foot and bears with ease the rigor of this climate, and withall I think it as pleasantly flavored as any species of that root I ever tasted."¹⁴ At Fort Clatsop, after learning that Chinookan Indians relished roots of the local cattail, Lewis wrote that these bulbs contained "a mealy or starch like substance which readily desolves in the mouth . . . it appears to me that this substance would make excellent starch; nothing can be of a purer white than it is."¹⁵

Lewis devoted much space to those plants discovered en route to the Pacific which eased personal food problems. They provided a welcome change from a diet almost exclusively meat and, on occasion, saved the men from hunger if not actual starvation. There are repeated references to such wild fruits as gooseberry, currant and serviceberry, and to such roots as wapato, camas, edible thistle (*Cirsium edule*), western bracken (*Pteridium aquilinum pubescens*), seashore lupine (*Lupinus littoralis*), cous (*Lomatium cous*) and white apple (*Psoralea esculenta*).

Some of the plants described by Lewis possessed utilitarian value in other ways. The narrow-leaved willow (*Salix longifolia*) was "generally used by the watermen for *setting poles* [that is, long sturdy poles for pushing the boats upstream] in preference to any thing else," and the wood of the Oregon crab apple (*Pyrus fusca*) was superior to any other available "for ax handles as well as glutts or wedges."¹⁶ The broad-leaved cottonwood (*Populus deltoides occidentalis*) far overshadowed all other trees in importance to the expedition. They used it for dugout canoes, stockade and walls of Fort Mandan, wagons that transported their goods in the portage at Great Falls and fires that warmed bodies and cooked food. On many occasions cottonwoods, with their dense shimmering foliage, provided shelter from heat, wind and storm. Lewis and Clark were men of great resourcefulness, masters of ingenuity and improvisation. It is probable that they would have successfully crossed the continent without cottonwood, but their task would have been doubly difficult.

14. Thwaites, II:259.

15. Thwaites, IV:122.

16. Thwaites, VI:145-46; IV:20.

When treating the ill or wounded, Lewis occasionally drew upon his knowledge of simples (vegetable drugs). For example, when Private John Potts cut his leg and this member subsequently became infected and inflamed, he applied poultices of the roots of cous and leaves of the long-tailed wild ginger (*Asarum caudatum*).¹⁷ Readers familiar with the *Journals* will recall that Private William Bratton suffered for months with a stubborn back ailment that defied all remedies until he had been sweated Indian style in a large sweat hole. When describing this treatment, Lewis said that "during the time of his being in the sweat hole, he drank copious draughts of a strong tea of horse mint."¹⁸ At an earlier date, while reconnoitering near Great Falls, Lewis himself became ill with a severe pain in his intestines and an accompanying high fever. Since he had no medical supplies with him, he resolved to try an experiment with simples. After his men, pursuant to instructions, had collected a number of twigs of the chokecherry (probably a variety of the eastern wild cherry, *Prunus virginiana*), he had them boiled "untill a strong black decoction of an astringent bitter tast was produced."¹⁹ At dusk, Lewis drank a pint of this, and about an hour later downed another. By ten o'clock he was perspiring gently, his pain had left him and his fever had abated. That night, all symptoms which had disturbed him having disappeared, he slept soundly. The next morning at sunrise, fit and refreshed, he took another drink of his cherry elixir and resumed his march. (The following day, June 13, 1805, he became the first white man to gaze upon the beauty of the Great Falls of Montana.)

Jefferson had instructed Lewis to pay attention to "climate as characterized by . . . the dates at which particular plants put forth or lose their flowers, or leaf . . ."²⁰ Some examples of his industry in this direction, chosen at random from innumerable others, are as follows:

[April 1, 1804.] The spicewood is in full bloe, the dogs tooth violet, and may apple appeared above ground . . .

17. Thwaites, V:155, 165.

18. Thwaites, V:61. C. V. Piper identified this mint as *Lophanthus urticaefolius*, since it is the only large mint growing in the vicinity of Camp Chopunnish where Bratton was sweated.

19. Thwaites, II:142.

20. Thwaites, VII:249.

[October 14, 1804.] Cotton wood all yellow, and the leaves begin to fall, abundance of Grapes & red berries.

[April 13, 1805.] The leaves of the Choke cherry are about half grown; the Cotton wood is in blume the flower of this tree resembles that of the aspen in form, and is of a deep purple colour.

[March 25, 1806.] The Elder, Gooseberry, & Honeysuckle are now putting forth their leaves, the nettle and a variety of other plants are now springing up . . . several small plants in blume.²¹

In observing plants, as well as animals, Lewis habitually employed all of his senses. A species of angelica (probably *Angelica lyallii*) discovered in the Bitterroots was "much st[r]onger to the taist and more highly scented than that speceis common to the U' States."²² The flavor of the root of "a speceis of fennel" was "not unlike that of annis seed but not so pungent."²³ One mid-April day in 1805, just above the entrance of the Little Missouri River, Lewis wrote as follows: "on these hills many aromatic herbs are seen; resembling in taste, smel and appearance, the sage, hysop, wormwood, southernwood, and two other herbs which are strangers to me; the one resembling the camphor in taste and smell, rising to the hight of 2 or 3 feet; the other about the same size, has a long, narrow, smo[o]th, soft leaf of an agreeable smel and flavor."²⁴ In examining these aromatic herbs (probably different species of sagebrush), Lewis, as is evident, exercised practically every sense given him by his Creator: touch, to determine softness of leaf; smell and taste, to compare with his Virginia hyssop; and sight, to note similarities in size of plants and shapes of leaves. If, as someone has said, the mark of the true observer is his ability to bring into play all of his faculties simultaneously, then Lewis was at his best on this April day in western North Dakota.

As we stressed in writing of Lewis as a zoologist, he was particularly apt in seeing the little things so often overlooked, even by the most experienced observer. For example, he discovered below the Great Falls the narrow-leaved cottonwood

21. Thwaites, VI:172, 177, 188, 210.

22. Thwaites, V:138.

23. Thwaites, III:41.

24. Thwaites, I:307.

(*Populus angustifolia*). A few days later, above the falls, he commented that this species appeared to be replacing the broad-leaved form and, farther along, near the mouth of the Dearborn, "there is not any of the broad leaved cottonwood on the river since it has entered the mountains."²⁵ He was especially observant of those plants favored by animals. For instance, the antelope, buffalo and elk of the upper Missouri fed on the willows of the sandbars, and bears sought the fruit of the chokecherry.²⁶ He reported, too, a singular practice of the antelope. While feeding on sagebrush, they perfumed "the hair of their foreheads and necks with it by rubbing against it."²⁷

Throughout the journey Lewis was most diligent in collecting seeds and preserving herbarium specimens. For example, on April 12, 1805, just after the party had abandoned Fort Mandan, he reported, "I found some of the dwarf cedar of which I preserved a specimen."²⁸ Near Three Forks, on meeting with the species of wild onion earlier alluded to, he wrote: "it's seed had just arrived to maturity and I gathered a good quantity of it."²⁹ One day later he collected seed of *Linum lewisii*. In July of the next year, at the mouth of Traveller's Rest (Lolo) Creek, he reported finding a species of native clover "with a very narrow small leaf and a pale red flower" (*Trifolium microcephalum*) and "several other uncommon plants specemines of which I preserved."³⁰ In time, many different kinds of seeds returned by Lewis germinated in eastern gardens, among them currants, gooseberries, Arikara tobacco and Mandan corn. Other plants, such as Osage orange (*Maclura aurantiaca*) and bitterroot (*Lewisia redivivia*), were successfully grown from cuttings and roots Lewis had obtained.

The cardinal botanical achievement of Meriwether Lewis was the collection of herbarium specimens which today forms an original permanent record. How many he collected and returned no one will ever know; the number would have been

25. Thwaites, II:245.

26. Thwaites, I:338; II:29.

27. Thwaites, I:307.

28. Thwaites, I:299.

29. Thwaites, II:259.

30. Thwaites, V:180-81.

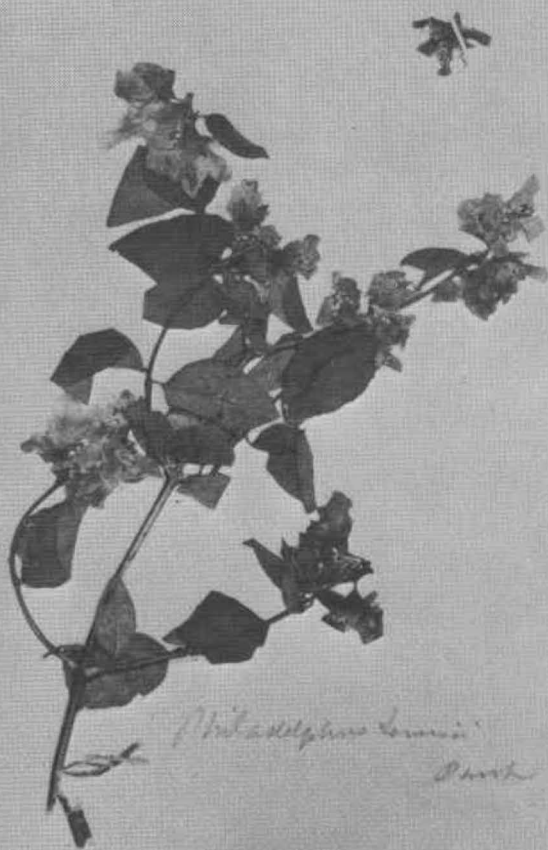
much larger, of course, except for the loss at Great Falls when flood water entered a cache, destroying all specimens collected in 1805 between Fort Mandan and the falls.

The job of pressing plants is not as simple as it sounds, even under optimum conditions of warm, sunshiny weather. Since they contain moisture, they require continued attention until fully dry, which means regular exposure to air and transferring to dry paper for many days running. During the periods when Lewis botanized most actively—as at Camp Chopunnish on the Clearwater River, for example—he may well have had three or four dozen specimens (or even more) to attend to daily. This meant removing them one at a time from the press, exposing them to sun and air for varying periods, later returning them to the press, and taking pains all the while to be certain that identification tags remained affixed. But there was more to it than that, as any plant collector knows. Even after specimens had been dried, Lewis had to supervise their transport and take every precaution against loss to rain, flash flood, fire or other destructive agency. A few years later Maximilian lost a valuable collection when the boat on which he was descending the Missouri caught fire and burned. Such losses completely nullify months of dedicated effort and inquiry and defeat prime scientific objectives.

Lewis's herbarium specimens consisted of two lots: one consigned to Jefferson from Fort Mandan in the spring of 1805, and the other returned by Lewis himself late the next year. In April, 1807, Lewis went to Philadelphia where he met Frederick Pursh and gave him his collection and \$70 "for assisting me in preparing drawings and arranging specimens of plants for my work."³¹ Pursh had been recommended to Lewis by Bernard McMahon, a prominent Philadelphia gardener, to whom Lewis entrusted many of his seeds and roots, and in whose home Pursh was then living.

Pursh later described Lewis's transfer of plants to him in these words: "A small but highly interesting collection of dried plants was put into my hands by this gentleman, in order to describe and figure those I thought new, for the purpose of

31. Donald Jackson, ed., *Letters of the Lewis and Clark Expedition with Related Documents, 1783-1854* (University of Illinois Press, Urbana, 1962), 463n5.



Philadelphus lewisii
Druck

(2.14)

Druck's copy of *lewisii* Druck

Druck from the
Racine County.

May 6th 1806.

Philadelphus



Philadelphus
lewisii Druck

(2.14)

On the waters of Clark Co.
Jul. 4th 1806.

TYPE COLLECTION

Lewis's syringa (*Philadelphus lewisii*), collected May 6 (left) and July 4, 1806, as inscribed above. Academy of Natural Sciences of Philadelphia.

inserting them in the account of his Travels, which he was then engaged in preparing for the press."³²

Lewis's death occurred on October 11, 1809. Soon after that untimely event, Pursh went to London, carrying with him several of Lewis's plants, as well as drawings and descriptions. Everything indicates that he took the specimens without obtaining permission, though he left behind with McMahon the bulk of the collection.

Once in London, where he arrived during the winter of 1811-1812, he began working under the patronage of A. B. Lambert, vice president of the Linnaean Society and well-to-do cabinet naturalist, and devoting his time almost exclusively to writing *Flora Americae Septentrionalis* which he published in 1814. This was an admirably executed two-volume work that, in breadth of treatment, exceeded anything heretofore written about the North American flora. Herein Pursh described a multitude of plants new to science, including 124 collected by Lewis which he identified with the abbreviated legend, "*v.s. in Herb. Lewis.*"

In an era when botanists were not always as scrupulous as today about extending credit where credit was due, it is refreshing to note that Pursh consistently recognized his indebtedness. Not only that, but in the case of Lewis and Clark, he honored them by creating the genera *Lewisia* and *Clarkia*, and by naming three new species after Lewis: *Linum lewisii* (Lewis's wild flax), *Mimulus lewisii* (Lewis's monkey flower) and *Philadelphus lewisii* (Lewis's syringa). Additionally, reflecting the importance he attached to Lewis's *hortus siccus*, he illustrated his *Flora* with 13 plants from that collection, 13 of a total of 27. One of these was *Clarkia pulchella*.

Pursh died in 1820, and the specimens he had obtained in the United States remained in Lambert's custody until the death of the latter in 1842. These were sold at auction later the same year. By good fortune a wealthy young American botanist, Edward Tuckerman, attended the auction and purchased many of the plants Pursh had taken to England, including several

32. Frederick Pursh, *Flora Americae Septentrionalis; or, a Systematic Arrangement and Description of the Plants of North America* (2 vols., London, 1814), I:x-xi.



Broad-leaved gum-plant (*Grindelia squarrosa*), collected by Lewis August 17, 1804, on Missouri just south of present-day Sioux City, Iowa.

originally the property of Lewis. Fourteen years later, in 1856, Tuckerman presented these to the Academy of Natural Sciences of Philadelphia. So the Lewis specimens that Pursh took with him as he left Philadelphia in 1811—at least the majority of them—finally came back to that city by merest chance, after an interval of almost 50 years.³³

In 1810 Clark located the herbarium specimens Pursh had left with McMahon and put them in the hands of Dr. Benjamin Smith Barton, professor of botany at the University of Pennsylvania. Incredibly, we find no further mention of the whereabouts of these plants until 1896, almost a century later. In that year a botanist at the Academy of Natural Sciences, Thomas Meehan, rediscovered them at the American Philosophical Society, Philadelphia. "After long and diligent research," Meehan subsequently wrote, "packages of plants were found . . . in the original packages as presented many years ago . . . with the freedom of three quarters of a century the beetles had made sad work in the bundles. In a few cases the specimens had been wholly reduced to dust, and only fragments were yet in other cases. Generally, however, they were in fair condition."³⁴ Their discovery, as Elliott Coues saw it, "was one of the happiest and most important that could have been made."³⁵ Since the American Philosophical Society had no facilities for taking care of herbarium specimens, they placed them on loan to the Academy of Natural Sciences where they have been ever since.

During the summer of 1966, with the generous approval and cooperation of Dr. Alfred E. Schuyler, present curator of botany, the writer attempted to locate and examine all existing specimens at the Academy of this extremely valuable and interesting collection. The results, in brief, are as follows:

(1) At last count, the Lewis and Clark Herbarium numbers 216 sheets. Because of considerable duplication (four sheets of

33. Joseph Ewan, professor of botany, Tulane University, has written me that some of the plants Pursh took to England are still there, either in Kew Gardens or British Museum (Natural History), or both.

34. Thomas Meehan, "The Plants of Lewis and Clark's Expedition Across the Continent," Academy of Natural Sciences of Philadelphia, *Proceedings* (1898), 13-14.

35. Elliott Coues, "Notes on Mr. Meehan's Paper on the Plants of Lewis and Clark's Expedition Across the Continent," *ANSP, Proceedings* (1898), 292.



Rice root or mission bells (*Fritillaria lanceolata*), collected April 10, 1806 on Brant Island just below Cascades of Columbia River.

Artemisia cana, for example), it naturally follows that the number of species represented is less.

(2) Considering lapse of time and inevitable handling and deterioration, the specimens are in surprisingly good condition. A specimen of rice root (*Fritillaria lanceolata*), for instance, is in such superlative condition that it might have been collected only yesterday; yet this plant was eased from the soft earth of Brant Island, in the lower reaches of the Columbia on April 10, 1806, more than 160 years ago.

(3) Due to indifferent and fragmentary specimens, one can only approximate the actual number of species represented, possibly 165 to 170. Conservatively, 70 to 75 of these were new to science when Lewis collected them.

(4) I have located 39 so-called "Lambert specimens," that is, plants taken by Pursh to London and later purchased by Tuckerman at the Lambert auction. They are easily recognizable because of the distinctively watermarked paper on which they had been mounted in London and by affixed tickets bearing the handwriting of Lambert or Pursh.

(5) A number of the sheets attract attention because they bear, usually in the lower left-hand corner, small accompanying tickets of a singular purplish-colored paper with concise data in Lewis's own handwriting about where and when the specimens had been collected. It is quite apparent that these tickets had been scissored from larger sheets of paper since their size and shape conform exactly to the space occupied by Lewis's data. On examining the paper more closely, I detected a strong similarity to ordinary blotting paper and became convinced that it must have been the kind Lewis had taken west with him for pressing his plants. Supporting this conviction is the fact that Dr. Barton used paper with a marked resemblance in thickness and absorptive quality in pressing his plants, many of which are housed today at the Academy. Since Lewis had consulted Dr. Barton during a visit to Philadelphia in 1803 before starting west, it is within the range of probabilities that the latter instructed him in the latest methods of preserving herbarium specimens and may have actually suggested, or provided him with, this kind of paper.



B
No. 39.

Nippophaea argentea
Nippophaea argentea
Pursh

Low

A
No. 39. H

From the mouth of the river Quicouare
from there upwards in all the Mifoun
bottoms; the heavy pleasant, cold
the Canby & Hong an. at some
Oregon.

lains at the mouth of the river Quicouare
can be seen plain upwards at it upwards
the Mifoun bottoms it is a pleasant heavy
at it has much the flavor of the cream
and continues at the back through the
the two evergreen shrubs.

(6) The majority of the Lewis plants in the Academy came from west of the Continental Divide. Of some 200 dated sheets (10 at least are dateless), Lewis collected 135 on the Columbia watershed and 65 on the Missouri. Broken down another way, he obtained 60 on the journey from St. Louis to Fort Mandan, 10 only from Fort Mandan to the Pacific and 130 during the winter at Fort Clatsop on the coast and on the east-bound journey back to St. Louis. The earliest dated specimen is a horsetail (*Equisetum arvense*) collected on August 10, 1804, near the mouth of the Little Sioux River, Iowa, and the latest a climbing vine of the grape family (*Ampelopsis cordata*) obtained on September 14, 1806, in the environs of present-day Leavenworth, Kansas. Approximately one fourth of the entire herbarium was collected in Idaho on the return journey, mainly at Camp Chopunnish on the Clearwater River. His stay here, lasting about one month, happily coincided with the appearance of many spring flowers, such as the beautiful ragged robin (*Clarkia pulchella*) and mariposa lily (*Calochortus elegans*).³⁶ The discovery of bitterroot (*Lewisia rediviva*), now the state flower of Montana, was an event of July 1, 1806, at the mouth of Lolo (Traveller's Rest) Creek just a few miles south of today's Missoula, Montana.

In concluding this report on the Lewis and Clark Herbarium, it should be added that many of the plants discovered and described by Lewis are not represented in this collection. A number of these quickly come to mind, such as the western serviceberry (*Amelanchier alnifolia*), narrow-leaved cottonwood (*Populus angustifolia*), grand fir (*Abies grandis*), lodgepole pine (*Pinus contorta*) and Engelmann's spruce (*Picea engelmannii*). Thus, as Elliott Coues has remarked: "There remains for someone the agreeable and useful task of reviewing Lewis and Clark's botanical text as distinguished from their specimens."³⁷

Age advances the value of many things, of old wines to drink, old wood for the fireplace and old books to read. And so

36. *Clarkia* and *Calochortus* were two of four new genera created by Pursh on the basis of specimens Lewis had placed in his hands, the others being *Lewisia* and *Tigarea*. *Tigarea* was later changed to *Purshia* when botanists discovered that that name had been preempted.

37. Coues, "Notes . . .," ANSP, *Proceedings* (1898), 292.

it is with these fragile dried plants brought back by Meriwether Lewis from the then unfathomed trans-Mississippi West and today preserved in the Academy of Natural Sciences of Philadelphia. They reside as mute, enduring symbols of this country's most dramatic epic of exploration, and of Lewis's monumental dedication to botany.

* * *

In the Jeffersonian era, botany and zoology were not as sharply segregated as they later became, and are today. Devotees of these sciences then customarily referred to themselves as naturalists or natural philosophers. In that era, too, botany came in for more attention than zoology because plants figured more prominently in treating and curing diseases. Many physicians studied botany avocationally, Dr. Benjamin S. Barton among them, and herb doctors flourished. Lewis's mother, Lucy Meriwether Lewis (Lucy Marks, after a second marriage), was a herb doctor. For many years she tended the sick of Albemarle County, Virginia, prescribing and administering simples. Thus, because of maternal ties, Lewis learned local plants of medicinal value and their purported therapeutic properties. As we have seen, the information he acquired of this character often colored his treatment of wounds and disorders suffered by himself and other members of the Corps of Discovery. This botanical knowledge was, of course, in addition to that obtained as a boy and young man in woods and fields and, subsequently, from Jefferson in the White House. In the foregoing "Meriwether Lewis: Zoologist," there is proof that this knowledge was substantial.

Because botany then enjoyed greater popularity than zoology, there was more published literature available on the former subject. If Lewis carried west with him books on animals, he has left no record of them; but he did carry at least three botanical texts: *Elements of Botany; or Outlines of the Natural History of Vegetables* (Philadelphia, 1803), by Benjamin Smith Barton; *An Illustration of the Sexual System of Linnaeus* (London, 1779), by John Miller; and *An Illustration of the Termini Botanici of Linnaeus* (London, 1789), by John Miller.³⁸ The last mentioned, we have reason to believe, served Lewis better

38. Thwaites, VII:241.

than the others, since it listed, defined and illustrated each and every one of the more than 150 botanical terms he employed in describing western plants. Barton's book must have been useful also. In light of Lewis's abundant technical vocabulary, he must have taken particular note of an introductory sentence which read: "One of the great objects of the botanist is the correct and discriminative description of plants . . . such a description cannot be given without the use of an appropriate language."³⁹ Incidentally, Barton's book was the first textbook of botany published in the United States; Lewis purchased his copy of it in Philadelphia while in that city in 1803 and paid \$6.00 for it.⁴⁰

In general knowledge, Lewis the botanist may have enjoyed an edge over Lewis the zoologist. But that is not to say that, once west of the Mississippi, he displayed a greater interest in plants. The truth is, he devoted practically three times as much space in his journals to animals as to plants, due not only to lengthy descriptions of the hunt for buffalo and other game animals, but also to the fact that he evinced far more interest in newly discovered animals than new plants. It would have been surprising if the reverse had been true, if he had exhibited more excitement over the discovery of sagebrush, bitterroot and narrow-leaved cottonwood than pronghorn antelope, mule deer, mountain quail and grizzly bear.

However, by the simple process of turning the coin, we find that Lewis in his writings, mentioned fully as many plants as animals, employed far more technical botanical terms and returned with a collection of plants much larger numerically than that of animals.

A modest man, Lewis tended to belittle his knowledge of plants. One day early in February, 1806, while at Fort Clatsop, he sat down to describe Douglas fir, Sitka spruce and other great evergreen trees constituting the rain forest surrounding him. He began by saying, "I shall discribe [them] as well as my slender botanically skil wil enable me . . ."⁴¹ Refuting this self-

39. Benamin S. Barton, *Elements of Botany; or Outlines of the Natural History of Vegetables* (Philadelphia, 1803), vii.

40. Thwaites, VII:241.

41. Thwaites, IV:41.



slide mount
17216
D. P. H. H.

On the Conahlaishkit.
July 7th 1806.

AMERICAN PHILOSOPHICAL
LEWIS & CLARK. HERB.
FROM THE ATLANTIC TO THE P.

Lupinus argenteus

Silvery lupine (*Lupinus argenteus*), collected by Lewis July 7, 1806, on headwaters of Blackfoot River near Lewis and Clark Pass. (Academy of Natural Sciences of Philadelphia.)

appraisal is the abundant botanical data found in his codices and the Lewis and Clark Herbarium in the Academy of Natural Sciences of Philadelphia. Of the latter a prominent botanist has written: "Lewis's specimens and data are as ample, or no more inadequate, than many collections made today by persons with considerable botanical training . . . Considering the inconveniences and accidents of the journey, one wonders so much material resulted."⁴² In the context of his day, Lewis was an unusually competent botanist, one with attitudes more consistent with botanists of the twentieth century than those of the early 1800s.

42. Velva E. Rudd, "Botanical Contributions of the Lewis and Clark Expedition," Washington Academy of Sciences, *Journal*, Vol. 44 (November, 1954), 357.