3. The mouth parts are developed for sucking only.

4. The attachment of the abdomen to the thorax in some flies shows that they once possessed a pedunculated abdomen, similar to that of Hymenoptera (p. 251).

Of these features, the first is the most weighty. Had not its importance been overlooked, the order could never have been thought inferior to the Lepidoptera, of which the members have while larvæ thoracic legs and usually abdominal ones also. Among the Hymenoptera, the Tenthredinidæ have thoracic legs and even more numerous abdominal ones than the Lepidoptera. The Uroceridæ also have rudimentary thoracic legs, although the larvæ are borers in wood.

The second and third arguments are essentially one in principle. In the lower winged insects, we find both pairs of wings of equal size and importance. The Hymenoptera show a condition in which the hind wings are much smaller and so of less use. Now, why do not the Diptera represent the extreme of this series? The question is not whether two pairs of wings or one pair are in themselves "higher;" it is rather, Which type shows the greater departure from the forms universally acknowledged as ancestral? So regarding the mouth development: If the mandibular mouth of Thysanura, Odonata, etc., be admitted as representing the ancestral form, then surely the mouth combining mandibular and suctorial apparatus is intermediate, and that with only suctorial organs is the ultimate degree of specialization. The recent researches of Dr. John B. Smith (Trans. Am. Ent. Soc., XVII.) show that true mandibles are almost never present in Diptera (he found them only in Simulium). Although his conclusions in this respect, as well as in regard to the homologies of the dipterous mouth in general, are widely different from those of earlier investigators, they are probably correct. In summing up, he says (p. 339), "The development required is simply a further development of the line started in the Hymenoptera."

An argument that strongly reinforces the first one above is found in the fact that the embryo in Diptera, at least in the higher forms, does not develop any traces of legs, differing in this respect from even the highest Hymenoptera, which first develop the legs and then reabsorb them before hatching (*Psyche*, June, 1891, p. 98).

The subject of mimicry also throws some light on these relations. As is well known, the Diptera afford many interesting cases of mimicry, and it is important to our theory to notice that they generally imitate the Hymenoptera, especially the very highest forms, such as wasps, humble-bees, and even honey-bees. One of the most widespread of all species, *Eristalis tenax* Linn., is such a good imitation of the honey-bee as to deceive the very elect. One of my students, an enthusiastic collector and well acquainted with this case of mimicry, once grasped a bee in his hand, under the impression that he was capturing one of these flies. Now, on any theory, we must admit that these species of flies are of more recent origin than the species which they mimic. Most of these imitative flies belong to the family Syrphidæ, which is considered to be one of the oldest of the group Cyclorrhapha, comprising the higher flies.

The Diptera, as a whole, are wonderfully rich in peculiar modifications of structure. In almost any organ the variety of forms exceeds that of any other order. Even the antennæ of beetles do not surpass, if they equal, those of flies in this respect. The wings are far more variable in venation than those of any other order. The variety and complexity of organs for grasping the female are almost beyond belief to one who has not seen them.

The one thing which has prevented the recognition of the real rank of the Diptera is a lingering notion that specialization by reduction really brings an insect down to a lower position in the scale. The word "high" suggests the idea of "complete," or "perfect," or "typical." If Professor Hyatt's test were to exclude every other, as it ought to, there could scarcely be any further disagreement on the question of the highest order.

The line of argument here suggested points to the Pupipara as the highest of all insects; nor would I in the least seek to evade the conclusion. Of the group, I have seen only the Hippoboscidæ; among these the sheep tick, *Melophagus ovinus* Linn, appears to deserve the highest rank.

J. M. ALDRICH.

DEBLOOMING MINERAL OILS.

It is a common practice with dealers in mineral lubricating oils and what are known as wool-stock and neutral oils to add certain chemicals to these oils to destroy the bluish fluorescence or "bloom." The bloom on ordinary refined kerosene is very noticeable, while paraffin oil, i.e., oil that has been distilled from petroleum tar, or residuum, is intensely blue. A good way to see the bloom of an oil is to view it through the ordinary four-ounce sample bottle. These bottles are made with straight sides and of white glass. A test-tube answers very well. The bottle should be held in front of a window and viewed through the bottom.

If a drop of oil be put on a piece of black glass, or on a piece of window-glass painted black on the bottom, the bloom will show even when the oil appears bloomless in the bottle. The bloom of oils may be destroyed or masked by nitric acid, nitro-benzol, di-nitro-naphthalene, and some other nitro-compounds. The use of nitric acid, of course, destroys the oil for lubricating purposes.

The di-nitro-naphthalene of commerce is a very efficient deblooming agent. I found, however, that if this material be washed in hot water until the free acid and free nitro-benzol (?) be washed out, it loses its deblooming properties.

A small percentage of oil of myrbane added to wool-oil or neutral oil will destroy or mask the bloom altogether. At the same time it, like the di-nitro-naphthalene, darkens the oil, and gives it the odor of benzol.

The usual practice is to add a quantity of di-nitro-naphthalene to a portion of the oil to be treated, warming it gently meanwhile, and then, when the oil is about to be sold, to add this strong solution to the bulk of the oil. This is done because the nitro compound is liable to crystallize out in the cold, and also to stain yellow the containing vessel and to darken the oil on standing.

If a bright piece of steel be put into oil containing much di-nitro-naphthalene the steel becomes corroded. It will be readily seen that such oil is unfit for lubricating purposes. If the oil be filtered while cold, fine crystals of di-nitro-naphthalene will collect on the filter, and at the same time the filter is stained yellow. The bloom reappears in the filtered oil, showing that the bloom was only covered up and not destroyed.

The only safe and proper way to bleach and debloom oil is to expose it to the sun and air for a long time — two or three weeks or so — depending on the weather. By this method no deleterious substances are added to the oil, while at the same time it is rendered sweeter in odor and the "body" is somewhat increased. The bleacher consists of a shallow tank, sometimes covered with glass, but more generally exposed to the sun and rain. Into these tanks a few

inches of water is run, and on top of this the oil. Any impurities settle to the bottom of the water, and are left when the oil is drawn off. In some of the larger refineries these bleachers literally cover acres of ground. The great objection to this method of bleaching is the length of time occupied and the immense space taken up by the bleachers.

It may be asked, What is the object of deblooming oils? So far as I can learn the only object is that they may be used to adulterate the more expensive animal and vegetable oils, such as lard, tallow, linseed, and cottonseed oils.

A mixture of lard oil, 75 per cent at 50 cents a gallon, and debloomed neutral oil, 25 per cent at 13 cents a gallon, will pass for pure lard-oil with anyone but an expert. This fraud may be detected by the lower flashing and burning points of the mixture and by the change in specific gravity from that of pure lard oil. The tests mentioned above may also be applied.

D. T. MARSHALL.

Boston, Mass., April 21.

ASTRONOMICAL NOTES.

[*Edited by George A. Hill.*]

Winnecke's Periodic Comet.

IN No. 3,083 of the *Astronomische Nachrichten* Dr. Haerdtl of Vienna publishes corrected elements for Winnecke's periodic comet, and also an ephemeris extending into next September. The comet will reach perihelion on July 1, be the nearest to the earth on July 9, when it will be only 11 million miles from the earth and attain a brightness 140 times that it had when found by Dr. Spetalerou March 18 last. The comet at the date of discovery was 72 million miles from the earth. The epoch of the ephemeris is for Berlin midnight.

	R.A.			Dec.		
	h	m	s		°	′
April 30	11	34	23	+	44	2
May 1		32	42		44	8
2		31	4		44	13
3		29	27		44	18
4		27	52		44	22
5		26	20		44	26
6		24	49		44	29
7		23	11		44	31
8		21	52		44	33
9		20	27		44	34
10		19	3		44	35
11		17	41		44	36
12		16	21		44	36
13		15	3		44	35
14		13	46		44	34
15		12	13		44	33
16	11	11	16	+	44	31

Comet Swift.

The following is a continuation of the ephemeris for comet Swift. This comet may prove to be a very interesting one, as the computations made seem to point to the fact that it is moving in a hyperbolic orbit. The observations at the present time do not extend over a sufficient interval to be absolutely sure of this statement, but as the comet is a bright one, it will probably give us a long series, when the question can be definitely settled. We have so few positive cases of comets moving in hyperbolic orbits that this one will receive at the hands of computers a very thorough discussion. The Rev. G. M. Searle, director of the Observatory of the Catholic University at Washington, has computed both hyperbolic and parabolic orbits for this comet. The difference between computation and observation for the middle places in the hyperbolic orbit is zero, while in the parabolic orbit it is + 15″ in longitude and + 7″ in latitude. The following is a continuation of the ephemeris published in No. 481 of *Science*.

	R.A.			Dec.		
	h	m	s		°	
May 8	22	53	10	+	25	28
9		55	58		26	6
10	22	58	45		26	42
11	23	1	30		27	18
12		4	13		27	53
13		6	55		28	28
14		9	35		29	2
15		12	14		29	35
16		14	51		30	7
17		17	27		30	39
18	23	20	1	+	31	11

Comet Denning.

The following is an ephemeris for comet Denning. The epoch is for Berlin midnight:

	B.A.			Dec.		
	h	m	s		°	
May 8	3	11	48	+	55	11
9		15	23		54	57
10		18	54		54	42
11		22	22		54	27
12		25	46		54	12
13		29	7		53	57
14		32	24		53	42
15		35	38		53	27
16		38	48		53	12
17		41	55		52	57
18	3	44	58	+	52	41

MR. PETRIE'S DISCOVERIES AT TEL-EL-AMARNA.

ONLY recently the news reached us of the discovery by the Direction of Exploration in Egypt of the tomb of King Amenhotep IV. (Khu-n-aten) at Tel-el-Amarna; and now, from another quarter, we hear of further important discoveries in the same locality.

The labors of Mr. W. M. Flinders Petrie, who has been working all winter at the excavation of the royal palace of Khu-n-aten, have been rewarded by a most unexpected find, one, indeed, that is unparalleled in the history of archæology. Lying on the ground, tossed in a corner among spoilt blocks of rough granite "Ushabtis," discarded by the artisans who had prepared the king's sepulchral furniture, lay the plaster cast, the mask, of the dead man himself, evidently taken immediately after his death by the sculptors employed to carve his statues. It is in an almost perfect state of preservation.

This extraordinary relic of one of the most interesting figures of antiquity lends unforseen support to the view of the monarch's character suggested in my last article. According to Mr. Petrie, the face thus revealed, as it were, in the flesh, "is full of character. There is no trace of passion in it, but a philosophical calm, with great obstinacy and im-