Inanimate Species
Joana Moll

This booklet belongs to the publication
Inanimate Species by Joana Moll.
2022

[Text]

What escapes the eye is the most insidious kind of extinction – the extinction of interactions

Daniel H. Janzen

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Jona Moll
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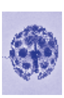
In 1971, a group of male engineers designed the first commercial microprocessor in history, Intel 4004. This event marked a decisive moment in recent history, as for the first time it was possible to translate intelligence to an inanimate object, which opened a new era in technological development and the emergence of a new technocapitalism imaginary. Interestingly, while humanity began a never-ending process based on perfecting and increasing the power of this new artificial intelligence, the planet's wildlife began to become extinct at an exorbitant rate. According to a study published in 2014 by the WWF, since 1970 humanity has wiped out 50% of the planet's species. It seems that there might be a correlation between the ubiquity of microprocessors, the rise of their computational power, and the acceleration of extinction processes. In order to illustrate this, the project establishes a link between the exponential growth of microprocessor and the decline in both number and diversity of species – in particular insects, who form an essential part of our ecological infrastructure and have been declining at alarming levels, with reports suggesting that a quarter of insects could be wiped out within just a decade. *Inanimate Species* display, seeks to highlight the subtle but continuous replacement of the natural order by technological advancement, and reflects not only on the cannibalisation of ecologies, but also on the problematics of visibly representing climate change.

Ultimately, Inanimate Species, sets out to expose the links between the explosion of technocapitalism, the acceleration of climate change and resulting decline of essential ecosystems.



This text is a parable[1] on extinction and pollution and how they can be measured. In *Inanimate Species*, Joana Moll proposes to express them quite literally in terms of analogy: encroachment of microchips is compared to the extinction of insects. The comparison between these two visually similar[2] groups of beings is a measure of artificiality of pollution, as well as of inherent inconsistencies in methods of measurement. The attempt to taxonomize microchips following the rules of taxonomizing life, which is an always/already artificial method applied to nature, suggests a possible way of forging an agreement on shared measures and values.

TALKING ABOUT POLLUTION: CARBON, COLONIALISM AND APPROPRIATION

Cumulative fossil fuel emissions constitute a major cause of anthropogenic pollution: they increase the concentration of carbon dioxide in the atmosphere[3] and contribute to global warming of the planet. To offset for this measurable pollution, many have suggested ways

to equate the levels of these emissions to some form of monetary investment. Global Carbon Budget is one prominent way of mediating between emission and investment, between scientific knowledge and policy making[4]. The suggested *globality* of the carbon budget paints the world united, and measures emissions as simple accumulation. But the global budget is not directly equitable to the global temperature increase. A direct translation between the two oversimplifies climate dynamics: temperature increases differently depending on how carbon emissions are distributed in time. Nevertheless, scientists today agree that budgeting might be the most

1 To speak of a *parable*, a narrative method for metaphorically expressing one thing through another, benefits here from its closeness to the geometrical form, *parabola*, which focuses reflection, such as the parabolic dish does for satellite antennas. Discussion on extinction and pollution are often moralizing, and this parable might prompt one to consider how this energy could be better focused on causes rather than effects of pollution.

2 To suggest visual similarity goes beyond superficiality of appearance and gestures towards the importance and persistence of vision as discussed in Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (1988): 575, doi.org/10.2307/3178066.

3 Systematic measurement of the effect of human industry on the increasing carbon dioxide content of the atmosphere started as a way to settle a scientific argument in a small group of UK and US oceanographers and geochemists in the 1950s. See Guy S. Callendar, "The Artificial Production of Carbon Dioxide and Its Influence on Temperature," *Quarterly Journal of the Royal Meteorological Society* 64, no. 275 (April 1938): 223–40, doi.org/10.1002/qj.49706427503. The longest continuous measurement is effectuated at the top of the extinct volcano Mauna Loa in Hawaii since 1957 and continues to this day, showing a continuously rising curve, which counters the initial belief that Oceans would absorb all human-made CO_2 emissions.

4 Bård Lahn, "A History of the Global Carbon Budget," *WIREs Climate Change* 11, no. 3 (May 2020), https://doi.org/10.1002/wcc.636.

robust and scientifically constrained measure of permissible emissions within a specific temperature increase limit.

The focus on permissible emissions frames pollution as a measurable and manageable phenomenon, presupposing unproblematic access and entitlement to land and resources, whose *assimilative capacity* can be measured. Max Liboiron demonstrated in *Pollution is Colonialism*[5] that the very understanding of pollution as 'assimilable' carries an extractive relationship to land, which is supposed to serve as a sink for discarded stuff. Pollution occurs when the sink is not any more able to clean itself. In other words, pollution is only problematic and only is really pollution when it saturates a certain threshold of measurement. This, for Liboiron, is one of many instances of a colonial relation to land. Pollution, they argue, is not a symptom of capitalism but a violent enactment of colonial relations that claim access to Indigenous land. In short, pollution is colonialism.

Any act of polluting is at the same time an act of appropriation. Michel Serres wrote about this co-incidence in his book about the ways in which pollution communicates power and hegemony[6]. The world is our host, and we appropriate it by filling air with fossil fuel emissions, releasing toxicants in water or saturating markets with products we do not need; we turn the world into objects that can be owned, into property. Instead of placing ourselves at the centre, Serres suggests to reserve the centre for things, and consider ourselves within them, like parasites[7]. While it is important to remember that saying 'we' in context of pollution tends to obscure differences in responsibility and access to resources, Serres' proposal could be read as a call to suspended judgement over entitlement. To be a parasite is to live off of the nutrient and energy of the host. Coincidentally, the term parasite is informed by the Ancient Greek notion of *parasitos*, denoting a person who eats at the table of another, who feeds beside the rich and earns their welcome by flattery[8]. Being a parasite and polluting is not the same, but they both manifest in appropriation and subversion of resources, eating the world next to one another.

5 Max Liboiron, *Pollution Is Colonialism* (Durham: Duke University Press, 2021).

6 Michel Serres, *Le mal propre: polluer pour s'approprier ?*, Nouvelle éd., Poche le Pommier (Paris: Éd. le Pommier, 2012). The word 'propre' in French refers to property, being one's own, as well as to the state of being clean.

7 The concept of the parasite is most prominently discussed in Serre's book under the same title, while it continuously appears in his thought and writing as a figure. See Michel Serres, *The Parasite*, trans. Lawrence R. Schehr (Baltimore: Johns Hopkins University Press, 1982).

8 Online Etymology Dictionary entry on parasite (n.) www.etymonline.com/word/parasite#etymonline_v_7195.

METABOLIC GROUNDS: THIS WILL EAT THAT

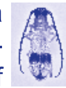
In *Inanimate Species*, Joana Moll systematically traces two seemingly unrelated trends: the increase in number and proliferation of microchips, and the loss of volume and number of known insect species. Looking at the Intel® 4004, the first commercial general-purpose programmable processor on one side, and the current insect extinction rates on the other, Moll's artistic project problematizes the tracking of biodiversity loss. The creation of the Intel microprocessor in 1971 could be alternatively dated in 'year 1' according to the Unix time[9]. Coincidentally, its commercial release enabled storing and manipulating large data collections at a large scale. It also coincided with the introduction of systematics documentation of biodiversity loss. While the loss in the number of species is hard to specify and is usually measured through comparison in volumes of insect mass, the proliferation of microchips can be measured precisely by transistor count, currently expressed in tens of sextillions.

Joana Moll's project seems to propose a metabolic relationship between microchips and insects, formed through pollution, parasitism and destruction of habitat. When microprocessors work, they consume energy. The making of microprocessors leaves holes in the ground where ores with rare-earth elements (REE) get extracted; the complex entanglements of fuels, chemicals, water and labor leave a significant environmental footprint. While certain kinds of insects, such as the dung beetle, metabolize the soil by working through excrements of other animals so earth can more easily absorb them, their comparison to the way microchips proliferate suggests that an inanimate species is about to eat up life. Importantly, the *Inanimate Species* hypothesis does not enter into polemic arguments about causal relationships. The comparison between the increase in anthropogenic mass, and reduction of insect biomass brings up the question what can be considered as 'life'.

MEASURING POLLUTION: TOPOLOGY AND TAXONOMY

The guiding principle for putting biodiversity loss and anthropogenic pollution on the same plane is visual: microprocessors look like bugs. The measurement of anthropogenic mass could be expressed in terms of equation of proportionalities, as a symbolic systematicity. Vera Bühlmann discussed such comparative approach to symbolization in her entry on 'Equation' for the *Posthuman Glossary*. Equation works beyond equating quantities as magnitude and multitude (for

9 Unix epoch or Unix time is an arbitrary date programmed into Unix operating system by Bell Labs engineers, chosen for convenience to be the 1st of January 1970.

example, ‘how much’ or ‘how many’ lost species), towards a symbolic systematicity that establishes a comparative method. Similarly, non-causality in *Inanimate Species’s* treatment of microprocessors and insects implies an articulation of a proportional comparison of unrelated magnitudes. Joana Moll encodes and decodes the relations and their qualities in this equation. 

The measurement of extinction could be also considered topologically: continuous transformations preserve certain properties under deformations, while propagating change across the topological space. In *Contagious Architecture*, Luciana Parisi extended her observation of indeterminacy in algorithmic processes to mereotopological relations[10]. Mereotopology is a technique of studying the relations between parts, relations of parts to wholes and boundaries between parts. How to account for parts that are bigger than wholes? The (mereo)topological space of pollution does not respond to our attempts to measure it discreetly. The strange taxonomy that comes out of Joana Moll’s work is informed by the interest in relations that can be articulated in terms of locations, or *topoi*, organizing visual similarity between microchips and insects, as well as across microchips themselves.

THE UNAVOIDABLE  IMPORTANCE OF EATING

Equating discreet pollution measurement to a budget, and observation of pollution thresholds are inadequate methods to address the indirect but perceivable relationship between the increase in anthropogenic mass and decrease in biodiversity. The comparison is articulated in visual similarities that escape the relation of direct equivalence in favor of proportionality and systematicity. Such measurement can be a way to agree on its position and values. *Inanimate Species* proposes an experimental approach to establishing ways to measure pollution and render it visible.

Coming back to the notion of parasite, which ways could we consider to measure information, or information infrastructures that are part of the anthropogenic mass? The concept of eating next to each other can readily involve eating off of each other. The practice of building a taxonomy of microchips should serve as a valuable gesture of recognizing their embeddedness in the living world. It articulates the polarity between the increase in volume of microchips and decline of biodiversity. Pollution is unorganized, and indeed might benefit from a taxonomy, in order to recognize ways in which it eats life.

10 Luciana Parisi, *Contagious Architecture: Computation, Aesthetics, and Space*, Technologies of Lived Abstraction (Cambridge, Massachusetts | London, England: The MIT Press, 2013). Mereotopology in Parisi follows on work by the mathematician Alfred North Whitehead, and extends on the notion of topology as discussed by Deleuze and Guattari.

What are the true costs of the digital utopia, the most powerful weapon of mass seduction in the expanding arsenal of techno-capitalism? The usual answers – the loss of privacy, the rise of fake news, the risks of cyberwarfare – are, of course, not wrong. But, in staying on the surface, they invariably miss the deeper shifts and transformations that are not immediate and whose effects cannot be directly and explicitly linked to the machinations of Mark Zuckerberg or Elon Musk.

The lie that nurtures the utopian myth behind techno-capitalism is that there is only one way to "do" Big Data or "artificial intelligence" or "cloud computing" – and that this way has already been discovered and perfected in Silicon Valley. The benefits are too numerous and obvious to be even discussed explicitly; a mere invocation of a regularity like the Moore's Law often suffices. The numbers go up – and this means "progress." As for the costs, those could be carefully accounted for, and, when we are lucky, mitigated.

What, however, if the costs of sticking to the "there is no alternative" agenda of techno-capitalism are considerably higher than what we have assumed? What if they are ultimately unknowable? What if the progress implied by Moore's law – which links together the speed, the size, and the cost of micro-processors – is ultimately as one-dimensional as the techno-capitalism has given birth to it, and that there are other parameters and metrics – above all, related to biodiversity but not limited to it – that, once accounted for, would significantly complicate our faith in the idea that more "techno-capitalism" means more "progress"?

One of the secrets for the immense resilience and longevity of the capitalist system has been its ability to disown the costs of its operations, shifting them onto others, and or setting them up in such a way that they would be paid by future generations. Some of the early critics (like one of the fathers of environmental economists, William Kapp) spoke of "cost-shifting," finding in it one of the primary driving forces of capitalism. When the true costs of its operation are engineered away, to be felt by others or at a much later point, it's no wonder that capitalism appears as a benevolent system.

Its latest iteration, techno-capitalism, has perfected these methods to a point where many of us do think that this new socio-economic system is truly as frictionless as its proponents advocate. Its legitimacy rests on the ability of big platforms to convert user data into implicit subsidies that cover the non-trivial costs of us using their services. It, thus, appears that the system truly

runs on magic: somehow, one can use the services of Facebook and Google without ever paying for them. There's no cost-shifting, Silicon Valley assures us, because there are no costs.

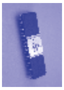
When the ideological debate is framed this way, it's no wonder that something like Moore's Law appears highly credible: we have been trained to believe that it's only benefits – and "progress"! – that one is to expect from digital technologies. It's no wonder that our ability to think about alternatives to this system is greatly constrained; when the costs are presumed not to exist, why should one even bother? This is what is truly at stake in making the costs of techno-capitalism fully visible: it's a pre-requisite to a genuine techno-politics that would be able to redirect digital technologies towards more emancipatory uses.

The ultimate irony of the past few decades has been that, in making our own lives increasingly more transparent and visible, techno-capitalism has done its best to confuse us about its own operations. There is a powerful epistemic asymmetry at work here: while all of us, as individuals, are expected to render ourselves objectively "knowable," techno-capitalism only wants to be known on its own terms, rendering vast chunks of its actual methods, processes, and infrastructures inscrutable. For the most part, they remain invisible as well.

How to we regain the capacity to see them and, hopefully, to discuss their effects? The conventional answer is that we could do that by refining our theories. Ultimately, techno-capitalism is still capitalism – and it's our inability to think through the political economy of data and its associated infrastructures that has rendered our analytical apparatus impotent. There's much truth in such a diagnosis. After several decades, we still don't know how to even speak about "data"; is it the product of one's labor or is it just a residue of social activity? As long as questions like these remain unresolved, we are not likely to get much conceptual – let alone visual – clarity from forays into political economy.

This leaves us with forms of narrative that, in bypassing the formalistic analysis of political economy, might nonetheless reveal some deep flaws in the conventional account of progress that we associate with techno-capitalism. Correlation does not imply causation, of course, but in our current intellectual environment, where the very terms of the debate have been undermined by our inability to think beyond techno-capitalism, correlation might also be good enough; to think in terms of causation is a sort of intellectual luxury that requires the sort of analytical maturity that we have not reached, alas.

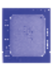
All we can hope for at this point is to grasp the limitations of our own current categories and concepts; it will take a lot of hard to work to develop an entirely different conceptual vocabulary to make sense



of the new environment – and to build a politics that would allow us to transcend techno-politics and all its limitations. But for this task of cognizing and working through our own limitations, correlations are not only more than enough – they are also a perfect instrument for jolting us out of the intellectual passivity by juxtaposing processes and activities that we would normally never perceive together.

Joana Moll's bold attempt to situate the rise of microprocessors against the decline of the number and the diversity  of insects is a wonderful and much-needed step in that direction. It's only by revealing the inadequacy of our notions of technological progress, with its artificial blindness and inattentiveness to criteria that are of no value to techno-capitalism that we would be able to regain our intellectual and political bearings, and, hopefully, steer the project of techno-capitalism from destroying all life on earth (even if it succeeds in doing so in the most intelligent manner possible).

The irony  of Moore' Law, which is taken as an article by faith by many in Silicon Valley, is that it illustrates something quite different from what its adherents believe. There's no better testament to the reality of capitalist competition – with competing firms always pouring money into outperforming their peers – that the history of the microchip: what many technologists take it to be just "natural" features of a given technology (e.g. the ever-shrinking

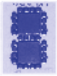


microchip) are actually just the effects of capitalist competition. But what drives the demand for all these  increases in speed that competing firms are rushing to provide? Is this constant insistence on speed rational?

To the extent that they go to support social and political projects of dubious utility, such gains in speed are of little emancipatory import. Just in the last decade, for example, we have witnessed a tremendous amount of computing power – underpinned, of course, by the ever-powerful processors – dedicated to the mining of crypto-currencies like Bitcoin. The increases in speed – the stuff of "progress" that techno-capitalism likes to boast of – that undoubtedly underpin such "advances" are of little societal value: the energy consumed in solving cryptographic puzzles (which is what "mining" is at the end of the day) is just a price to be paid for not trusting the state and needing some parallel, non-state system of doing accounting.

It very well might be, however, that this is hardly the only price to pay. And yet, just like in all the other instances of cost-shifting by the earlier capitalist regimes, we have not actually seen the bill yet. Shouldn't we be doing something to anticipate it? Shouldn't we demand as much transparency from techno-capitalism as it demands

of us? We certainly should – and it's in this space of speculative juxtaposition and critical correlationism that Joana's efforts to narrate the rise of microprocessors and the fall of insects make a long-lasting contribution. Hopefully, it will awaken us from our slumber and will make us reflect not only on the costs of progress but also on some of the alternative paths that it might take. Becoming better, faster, and more efficient at making human (as well as non-human) civilization obsolete should not count as “progress”, even if, under capitalism, it often is.



Joana Moll is a Barcelona/Berlin based artist and researcher. Her work critically explores the way techno-capitalist narratives affect the alphabetization of machines, humans and ecosystems. Her main research topics include Internet materiality, surveillance, social profiling and interfaces. She has presented her work in renowned institutions, museums, universities and festivals around the world such as Venice Biennale, MAXXI, MMOMA, Laboral, CCCB, ZKM, Bozar, The Natural History Museum in Berlin, Austrian Museum of Applied Arts (MAK), Ars Electronica, HEK, Photographer's Gallery, Korean Cultural Foundation Center, Chronus Art Center, New York University, Georgetown University, Rutgers University, University of Cambridge, Goldsmiths University of London, University of Illinois, Concordia University, Universitat Autònoma de Barcelona, ETH Zürich, École d'Art d'Aix en Provence, British Computer Society, The New School, CPDP 2019, Transmediale, FILE and ISEA among many others. Her work has been featured extensively on international media including The New York Times, The Financial Times, Der Spiegel, National Geographic, Quartz, Wired, Vice, The New Inquiry, Netzpolitk, El Mundo, O'Globo, La Reppublica, Fast Company, CBC, NBC or MIT Press.

She is currently a visiting lecturer at Universität Potsdam and Escola Elisava in Barcelona; an artistic researcher in residence at HGK FHNW in Basel, a research fellow at BBVA Foundation and a fellow at The Weizenbaum Institute in Berlin. Her work is available at janavirgin.com

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[Images]

mining bee
(Megandrena enceliae)
Det. Cockerell 1927

US CA Riverside County
6 - IV - 1966
coll. W.J. Turner

mining bee
(Calliopsis barbata)
Det. Timberlake 1952

US CA Merced County
19 - IV - 1966
coll. R.R. Snelling

mining bee
(Andrena vespertina)
Det. Linsley & MacSwain 1961

US CA Kern County
27 - III - 1959
coll. G.I. Stage

andrenin bee
(Andrena perplexa)
Det. Smith 1853

US CO Boulder County
22 - V - 1962
coll. R.W. Thorp

mining bee
(Andrena prunorum)
Det. Cockerell 1896

US CA Los Angeles County
15 - IV - 1936
coll. E.G. Linsley

potter wasp
(Leptochilus erubescens)
Det. Bohart 1940

US CA San Diego
29 - III - 1891
coll. Blais

braconid wasp
(Apanteles canarsiae)
Det. Ashmead 1898

US CA Albany
1968
coll. R.L. Doutt

gall wasp
(Andricus gallaetinctoriae)
Det. Olivier 1791

Ukraine Transcarpathia
10 - V - 1991
coll. G. Melika

chalcid wasp
(Podagrion mantidiphagum)
Det. Girault 1917

US TX Hidalgo County
1978
coll. C.C. Porter

chalcid wasp
(Pseuderimerus indicus)
Det. Subba Rao & Bhatia 1962

India
11 - V - 1987
N/A

chalcid wasp
(Megastigmus pistaciae)
Det. Walker 1871

Greece
19 - IX - 1986
coll. C.F. Mann

chalcid wasp
(Megastigmus suspectus ssp. pinsapinis)
Det. Hoffmeyer 1931

Turkey
5 - V - 1964
coll. U.R. Kahn

Pteromalid Wasp
(Pteromalus puparum)
Det. Linnaeus 1758

US CA Los Angeles County
10 - XI - 1977
coll. G.K. Bryce

trefoil seed chalcid
(Bruchophagus platypterus)
Det. Walker 1834

US SD Brookings
1989
coll. A. Boe

chalcid wasp
(Conura phais)
Det. Burks 1940

US OR Medford
6 - VI - 1968
coll. M Vandehey

eulophid wasp
(Chrysocharis laricinellae)
Det. Ratzeburg 1848

UK England
1936
N/A

encrytid wasp
(Anagyrus kamali)
Det. Moursi 1948

China
1 - IX - 1996
coll T. Cross

chalcidid wasp
(Brachymeria hammari)
Det. Crawford 1915

US TX Brownwood
18 - V - 1928
coll. C.C. Pinkney

orchid bee
(Euglossa viridissima)
Det. Friese 1899

Belize San Antonio
25 - IV - 1972
coll. E.W. Stiles

horsefly-like carpenter bee
(Xylocopa tabaniformis ssp. androleuca)
Det. Michener 1940

US CA Inyo County
24 - IV - 1957
coll. G.I. Stage

annona seed wasp
(Bephratelloides cubensis)
Det. Ashmead 1894

Mexico
24 - VI - 1948
N/A

digger bee
(Anthophora ursina ssp. ursina)
Det. Cresson 1869

US CO Boulder County
28 - IV - 1929
coll. R.W. Brooks

ant
(Strumigenys emmae)
Det. Emery 1890

Hong Kong
27 - X - 1966
N/A

mining bee
(Andrena mellea)
Det. Cresson 1868

US AZ Cochise County
13 - XIII - 1974
coll. J.M. Linsley

blister beetle
(Epicauta lauta ssp. lauta)
Det. Horn

Mexico Sonora
1953
N/A

cucurbit beetle
(Diabrotica speciosa)
Det. Germar 1824

Argentina
1950
N/A

leaf beetle
(Isotes mexicana)
Det. Harold 1875

Mexico Jalisco
1960
N/A

dung beetle
(Liatongus phanaeoides)
Det. Westwood 1839

Mexico
1945
coll. L. Gressitt

white spotted flea beetle
(Monolepta signata)
Det. Olivier 1808

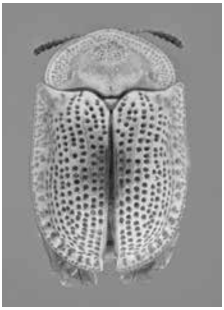
China Yungan City
1941
coll. L. Gressitt

stag beetle
(Odontolabis dalmani ssp. intermedia)
Det. Van de Poll 1889

Philippines
N/A
coll. E.R. Leach

hispine beetle
(Xenochalepus omogerus)
Det. Crotch 1873

Mexico Jalisco
1974
N/A



tortoise beetle
(Nuzonia pallidula)
Det. Boheman 1854

US CA Los Angeles
N/A
coll. Van Dyke

seed beetle
(Stator vittatithorax)
Det. Pic 1930

Mexico Yucatan
1980
N/A

leaf beetle
(Colaspis prasina)
Det. Lefevre 1878

Mexico
N/A
coll. A. Fenyes

plant-eating lady beetle
(Epilachna niponica)
Det. Lewis

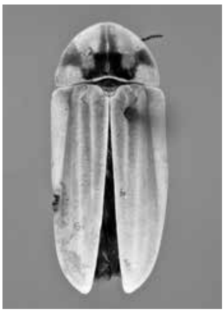
Japan Lake Towada
1924
coll. Van Dyke

red lady beetle
(Cycloneda munda)
Det. Say 1835

Canada Penticton
1927
coll. F.T. Scott

weevil
(Nerthops guttula)
Det. Olivier 1807

South Africa Argent
7 - XII - 1953
coll. A.L. Capener



firefly
(Aspisoma depictum)
Det. Gorham 1880

Mexico Verazcruz
1955
coll. N.L.H. Krauss

flea beetle
(Gynandrobrotica nigrofasciata)
Det. Jacoby 1878

Mexico
1946
coll. Van Dyke

broad-nosed weevil
(Heteroglymma alata)
Det. Heller 1900

Philippines Mount Santo Tomas
1931
coll. F.C. Hadden

weevil
(Hybreoleptops tuberculifer)
Det. Boheman 1842

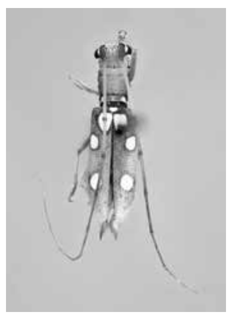
Chile Temuco
1951
N/A

longhorned beetle
(Megaderus stigma)
Det. Linnaeus 1758

French Guiana
1992
coll. F. Hovore

antlike weevil
(Myrmex lineatus)
Det. Casey 1872

US CA Inyo County
1982
coll. W.H. Nutting



flat-faced longhorn beetle
(Olenecamptus bilobus ssp. tonkinus)
Det. Dillion & Dillion 1948

Vietnam Hao Binh Province
N/A
coll. L. Gressitt

leaf beetle
(Ophraella communa)
Det. LeSage 1986

US CA Monterey County
1911
coll. L.S. Slevin

long-horned beetle
(Orwellion gibbulum ssp. arizonense)
Det. Casey 1891

Mexico Sonora
2004
coll. F. Hovore

long-horned beetle
(Phymatodes varius)
Det. Casey 1912

US AZ Cochise County
1981
coll. F. Hovore

flat-faced longhorn beetle
(Psapharochrus letralis)
Det. Bates 1861

Peru Junin
1935
N/A

leaf-rolling weevil
(Haplorhynchites mexicanus)
Det. Gyllenhal 1833

Mexico Jalisco
1974
coll. L.B. O'Brien

stag beetle
(Prosopocoilus astacoides ssp. blanchardi)
Det. Parry 1873

Taiwan
1935
coll. L. Gressitt

midway emerald beetle
(Proaeatia pryeri)
Det. Janson 1888

Japan Okinawa
1945
coll. E.R. Leach

masked chafer
(Cyclocephala porioni)
Det. Dechambre 1979

Costa Rica Cartago Province
18 - V - 1992
coll. Andrews & Gilbert

jewel beetle
(Sphaerobothris platti)
Det. Cazier 1938

US CA Inyo County
1982
coll. D. Guiliani

red spotted tortoise beetle
(Chelymorpha varians)
Det. Blanchard 1851

Chile Valdivia
28 - I - 2001
coll. F.G. Andrews

lady beetle
(Anatis quindecimpunctata)
Det. De Geer 1775

US MI Washtenaw County
27 - V - 1955
coll. G.H. Nelson

metallic wood-boring beetle
(Pachyschelus purpureus ssp. azureus)
Det. Waterhous 1889

Honduras Atlantida
5 - IX - 1984
coll. C.W. O'Brien

cream-colored lady beetle
(Neohalyzia perroudi)
Det. Mulsant 1850

Panama Chiriqui
24 - V - 1993
coll. Andrews & Gilbert

leaf beetle
(Malacorhinus irregularis)
Det. Jacoby 1879

Costa Rica La Pacifica
31 - V - 1992
coll. Andrews & Gilbert

flower chafer
(Euphoria subtomentosa)
Det. Dejean 1837

Mexico Oaxaca
18 - X - 2006
coll. C.L. Bellamy

tortoise beetle
(Charidotis incincta)
Det. Boheman 1862

Panama Panama Province
3 - VI - 1993
coll. Andrews & Gilbert

flea beetle
(Walterianella biarcuata)
Det. Chevrolat 1834

Honduras Cortes Department
7 - VI - 1996
coll. Andrews & Gilbert

longhorned beetle
(Trichoxys sulphurifer)
Det. Chevrolat 1860

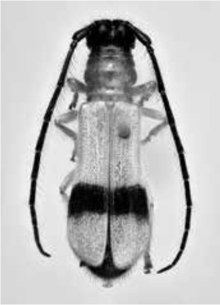
Mexico Puebla
4 - X - 2003
coll. A.D. Mudge

tortoise beetle
(Microctenochira vivida)
Det. Boheman 1855

Honduras Atlantida
30 - V - 1996
coll. Andrews & Gilbert

pine weevil
(Heilipus trifasciatus)
Det. Fabricius 1787

Panama Frijoles
30 - VI - 1919
coll. Dirtz & Zetek



flat-faced longhorn
(Phaea crocata)
Det. Pascoe 1866

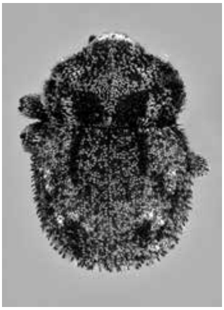
Panama Fort Kobbe
28 - V - 1986
coll. F.T. Hovore

metallic wood-boring beetle
(Paratyndaris chamaeleonis)
Det. Skinner 1903

US TX Brewster County
10 - VI - 1930
coll. E.G. Linsley

flat-faced longhorn
(Microcleptes aranea)
Det. Newman 1840

Chile Zapallar
27 - XI - 1950
coll. Ross & Michelbacher



weevil
(Tamphillus amplicollis)
Det. Fairmaire 1849

US CA Los Angeles
27 - V - 1948
coll. H. Daniels

hispine beetle
(Microrhopala pulchella)
Det. Baly 1864

Mexico Oaxaca
15 - VII - 2003
coll. C.L. Bellamy

flower chafer
(Euphoria subtomentosa)
Det. Dejean 1837

Mexico Puebla
16 - X - 1986
coll. E. Fisher

darkling beetle
(Pechalius vestitus)
Det. Casey 1891

US AZ Cochise County
8 - VIII - 1952
coll. Leech & Green

flea beetle
(Kuschelina decorata)
Det. Blanchard 1851

Chile Temuco
8 - I - 1951
coll. Ross & Michelbacher

lacebug
(Leptopharsa lineata)
Det. Champion 1897

Peru Tingo Maria
1946
coll. E.J. Hambleton

lacebug
(Dictyla labeculata)
Det. Uhler 1893

US OR Cornelius
1938
coll. Schuh&Gray

stink bug
(Thyanta juvenca)
Det. Stal 1862

Chile Santiago Province
1954
coll. L.E. Pena

rice stink bug
(Oebalus pugnax)
Det. Fabricius 1775

US VA Nelson County
1923
coll. W. Robinson

stink bug
(Acledra dimidiaticollis)
Det. Spinola 1852

Uruguay Montevideo
1940
coll. Berry

stink bug
(Piezosternum subulatum)
Det. Thunberg 1783

Peru Huanuco
1954
coll. F. Woytkowski

variegated caper bug
(Stenozygum coloratum)
Det. Klug 1845

Jordan Amman Gorvernate
1994
N/A

lace bug
(Leptopharsa ovantis)
Det. Drake & Hambleton 1945

Colombia Cocorna
1977
coll. R. Velez

lace bug
(Urentius euonymus)
Det. Distant 1909

Mauritania
1978
coll F.M. Philips

seed-feeding jewel bug
(Agonosoma trilineatum)
Det. Fabricius 1781

British West Indies Grenada
1891
coll. Summers

lace bug
(Stephanitis nashi)
Det. Esaki&Takeya 1931

Japan
1985
coll. R. Miyamoto

leaf miner moth
(Leucoptera sinuella)
Det. Reutti 1853

N/A
N/A
N/A

cotton leafworm / tobacco cutworm
(Spodoptera litura)
Det. Fabricius 1775

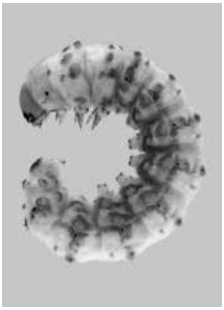
N/A
N/A
N/A

pyrausta moth
(Pyrausta sp.)
Det. Schrank 1802

N/A
N/A
N/A

corn earworm / tomato fruitworm
(Helicoverpa zea)
Det. Boddie

N/A
N/A
N/A



new world stalkborer
(Diatraea considerata)
Det. Heinrich 1931

N/A
N/A
N/A

twirler moth
(Aristotelia sp.)
Det. Hübner 1825

N/A
N/A
N/A

checkered white
(*Pontia protodice)*
Det. Boisduval & Le Conte 1830

N/A
N/A
N/A

four dotted agonopterix moth
(Agonopterix robiniella)
Det. Packard 1869

N/A
N/A
N/A

large white butterfly
(Pieris brassicae)
Det. Linnaeus 1758

N/A
N/A
N/A

moth
(Gonioterma mistrella)
Det. Busck 1907

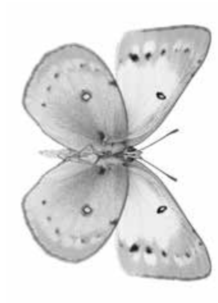
N/A
N/A
N/A

marble
(Euchloe sp.)
Det. Hübner 1819

N/A
N/A
N/A

great southern white
(Ascia monuste)
Det. Linnaeus 1764

N/A
N/A
N/A



alfalfa caterpillar
(Corias eurytheme)
Det. Boisduval 1852

N/A
N/A
N/A

cloudy arches moth
(Polia imbrifera)
Det. Guenee 1852

N/A
N/A
N/A

dingy cutworm
(Feltia jaculifera)
Det. Guenee 1852

N/A
N/A
N/A

astronomer moth
(Olethreutes astrologana)
Det. Zeller 1875

N/A
N/A
N/A

tortricid moth
(Acleris holmiana)
Det. Linnaeus 1758

N/A
N/A
N/A

Nason's slug
(Natada nasoni)
Det. Grote 1876

N/A
N/A
N/A

red-spotted sweetpotato moth
(Polygrammodes elevata)
Det. Fabricius 1777

N/A
N/A
N/A

purple-crested slug moth
(Adoneta spinuloides)
Det. Heinrich & Schaeffer
1854

US NC Jackson County
1974
coll. D.C. Ferguson

tropical gypsy moth
(Lymantria pelospila)
Det. Turner 1915

N/A
N/A
N/A

emperor dragonfly
(Anax imperator)
Det. Leach 1815

N/A
N/A
N/A

shore fly
(Cressonomyia skinneri)
Det. Cresson 1922

Mexico Hacienda Santa Engracia
7 - I - 1941
coll. G.E. Bohart

walnut fly
(Rhagoletis juglandis)
Det. Cresson 1920

US AZ Cochise County
19 - VIII - 1976
coll. L.L. Lambert

house fly
(Eusdasyphora cyanicolor)
Det. Zetterstedt 1845

US NY Tompkins County
25 - X - 1937
coll. H.I. Scudder

soldier fly
(Ptecticus testaceus)
Det. Fabricius 1805

Trinidad and Tobago Arima Valley
1970
coll. D.E. Breedlove

rust fly
(Psila nigricornis)
Det. Meigen 1826

UK Essex
14 - V - 1955
coll. R.D. Weal

house fly
(Ophyra aenescens)
Det. Wiedemann 1830

US CA San Mateo County
22 - V - 1952
coll. P.H. Arnaud

eye gnat
(Liohippelates flavipes)
Det. Loew 1886

Colombia Caldas
17 - V - 1955
coll. Schlinger & Ross

house fly
(Helina steini)
Det. Pont 1988

Canada Alberta
27 - VI - 1925
coll. O. Bryant

soldier fly
(Cyphomyia erecta)
Det. McFadden 1969

US AZ
22 - VII - 1982
coll. W.J. Pulawski

cornsilk fly
(Euxesta annonae)
Det. Fabricius 1794

Puerto Rico Arecibo
24 - VI - 1915
N/A

fruit fly
(Dyseuaresta mexicana)
Det. Wiedemann 1830

US FL Miami-Dade County
4 - X - 1970
coll. C. Stepmaier

picture-winged fly
(Acrosticta apicalis)
Det. Williston 1896

Guam Ritidiam
1946
coll. Gressit

fruit fly
(Xanthaciura insecta)
Det. Loew 1862

US FL Highlands County
7 - X - 1964
coll. P.H. Arnaud

bathurst burr seed fly
(Euaresta bullans)
Det. Wiedemann 1830

Chile Nuble Region
24 - XII - 1950
coll. Ross & Michelbacher

speckled-winged rangeland grasshopper
(Arphia conspersa)
Det. Scudder 1875

US CO Weld County
5 - IV - 2015
coll. T.J. McNary

groove-headed grasshopper
(Conozoa sulcifrons)
Det. Scudder 1876

US WA Richland
1972
coll. L. Rogers

painted grasshopper
(Poekilocerus pictus)
Det. Fabricius 1775

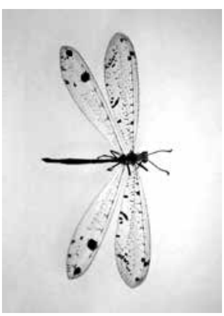
Afghanistan Jalalabad
1962
coll. D. Jailani

grashopper
(Acrida exaltata)
Det. Walker 1859

Afghanistan
1966
coll. Pfadt

two-striped slantface grass-hopper
(Mermiria bivittata)
Det. Serville 1838

US WY Crook County
2014
coll. B. Herring



spottedwinged antlion
(Dendrolean obsoletus)
Det. Say 1839

N/A
N/A
N/A

white-footed ant
(Technomyrmex albipes)
Det. Smith 1861

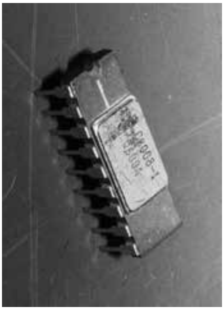
N/A
N/A
N/A

carpenter ant
(Camponotus nearcticus)
Det. Emery 1893

N/A
N/A
N/A

Intel 4004
2250 T / 10000 nm
Det. Intel 1971

USA CA Sta. Clara
15 - XI - 1971
coll. Intel

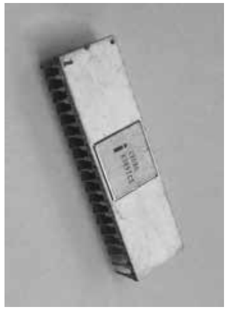


Intel 8008
3500 T / 10000 nm
Det. Intel 1972

USA CA Sta. Clara
01 - IV - 1972
coll. Intel

NEC Œ°COM-4
2500 T / 7500 nm
Det. NEC 1973

JP Kanagawa Sagamihara
01 - II - 1973
coll. NEC



Intel 8080
6000 T / 6000 nm
Det. Intel 1974

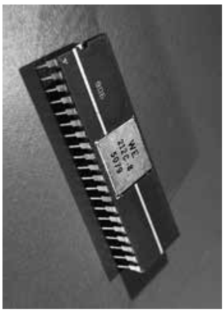
USA CA Livermore
15 - IV - 1974
coll. Intel

MOS Technology 6502
4530 T / 8000 nm
Det. MOS Technology 1975

USA PA Audubon
24 - VII - 1975
coll. MOS Technology

Zilog Z80
8500 T / 4000 nm
Det. Zilog Inc. 1976

USA CA Sta. Clara
01 - III -1976
coll. Synertek



Bellmac-8
7000 T / 5000 nm
Det. Bell Labs 1977

USA NJ Holmdel Township
01 - I - 1977
coll. Bell Labs

Intel 8086
29000 T / 3000 nm
Det. Intel 1978

USA OR Aloha
08 - VI - 1978
coll. Intel

Intel 8088
29000 T / 3000 nm
Det. Intel 1979

USA OR Aloha
01 - VI - 1979
coll. Intel

Motorola 68000
68000 T / 3500 nm
Det. Motorola 1980

USA CA Newport Beach
01 - II - 1980
coll. Rockwell

WDC 65C02
11500 T / 3000 nm
Det. WDC 1981

USA CA Newport Beach
01 - I - 1981
coll. Rockwell

Intel 80286
134000 T / 1500 nm
Det. Intel 1982

USA AZ Chandler
01 - II - 1982
coll. Intel

WDC 65C816
22000 T / 3000 nm
Det. WDC 1983

USA CA Sta. Clara
01 - I - 1983
coll. Synertek

Motorola 68020
190000 T / 2000 nm
Det. Motorola 1984

MLAS Negeri Sembilan
Seremban
01 - I - 1984
coll. Motorola

Intel 80386
275000 T / 1500 nm
Det. Intel 1985

USA CA Sta. Clara
01 - X - 1985
coll. Intel

ARM 2
27000 T / 2000 nm
Det. Acorn Computers 1986

USA CA San Jose
01 - XII - 1986
coll. VLSI Technology

TI Explorer 32-bit Lisp machine chip
553000 T / 2000 nm
Det. Texas Instruments 1987

USA TX Dallas
01 - I - 1987
coll. Texas Instruments

Intel i960CA
250000 T / 1500 nm
Det. Intel 1988

IL Jerusalem
01 - I - 1988
coll. Intel

Intel 80486
1180000 T / 1000 nm
Det. Intel 1989

IL Jerusalem
01 - IV - 1989
coll. Intel

Motorola 68040
1200000 T / 650 nm
Det. Motorola 1990

MLAS Negeri Sembilan
Seremban
01 - I - 1990
coll. Motorola

R4000
1350000 T / 1000 nm
Det. MIPS 1991

JP Mie Yokkaichi
01 - X - 1991
coll. Toshiba

DEC Alpha 21064
1680000 T / 750 nm
Det. DEC 1992

UK SL South Queensferry
25 - II - 1992
coll. Digital Equipment

Pentium
3100000 T / 800 nm
Det. Intel 1993

IL Jerusalem
22 - III - 1993
coll. Intel

PowerPC 604
3600000 T / 500 nm
Det. IBM & Motorola 1994

USA NY East Fishkill
01 - I - 1994
coll. IBM

Pentium Pro
5500000 T / 350 nm
Det. Intel 1995

IE Kildare Leixlip
01 - XI - 1995
coll. Intel

AMD K5
4300000 T / 500 nm
Det. AMD 1996

USA TX San Antonio
27 - 03 - 1996
coll. AMD

AMD K6
8800000 T / 350 nm
Det. AMD 1997

USA TX San Antonio
02 - 04 - 1997
coll. AMD

RS64-II
125000000 T / 350 nm
Det. IBM 1998

USA VT Burlington
01 - I - 1998
coll. IBM

Pentium II Mobile Dixon
27400000 T / 180 nm
Det. Intel 1999

USA OR Hillsboro
01 - I - 1999
coll. Intel

Pentium 4 Willamette
42000000 T / 180 nm
Det. Intel 2000

USA OR Hillsboro
20 - XI - 2000
coll. Intel

SPARC64 V
191000000 T / 130 nm
Det. Fujitsu 2001

JP Mie Kuwana
01 - 12 - 2001
coll. Fujitsu

Itanium 2 McKinley
221000000 T / 180 nm
Det. Intel 2002

USA OR Hillsboro
07 - VIII - 2002
coll. Intel & HP

Opteron 240 SledgeHammer
106000000 T / 130nm
Det. AMD 2003

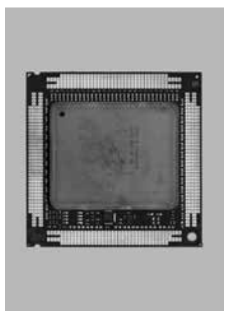
USA TX San Antonio
22 - IV - 2003
coll. AMD

Itanium 2 Madison
592000000 T / 130nm
Det. Intel 2004

USA OR Hillsboro
01 - 04 - 2004
coll. Intel

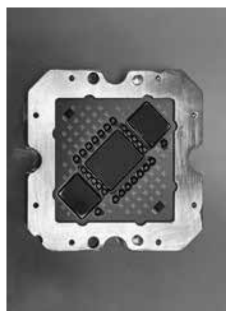
UltraSPARC T1
300000000 T / 90 nm
Det. Sun Microsystems 2005

USA TX Dallas
14 - XI - 2005
coll. Texas Instruments



Dual-core Itanium 2 Montecito
1720000000 T / 90 nm
Det. Intel 2006

IL Kiryat Gat
18 - VII - 2006
coll. Intel



POWER6
790000000 T / 65 nm
Det. IBM 2007

USA NY East Fishkill
08 - VI - 2007
coll. IBM

Xeon 7400 Dunnington
190000000 T / 45 nm
Det. Intel 2008

USA NM Rio Rancho
15 - IX - 2008
coll. Intel

Opteron 2400 Istanbul
904000000 T / 45 nm
Det. AMD 2009

DE Dresden
02 - VI - 2009
coll. Global Foundries

Xeon Nehalem-EX
2300000000 T / 45 nm
Det. Intel 2010

USA AZ Chandler
01 - I - 2010
coll. Intel

Xeon Westmere-EX
2600000000 T / 32 nm
Det. Intel 2011

USA OR Hillsboro
01- III - 2011
coll. Intel

Xeon Phi Clovertown
5000000000 T / 22 nm
Det. Intel 2012

IL Kiryat Gat
12- XI - 2012
coll. Intel

POWER8
4200000000 T / 22 nm
Det. IBM 2013

USA NY East Fishkill
01 - VIII - 2013
coll. Global Foundries

Xeon Haswell-E5
5560000000 T / 22 nm
Det. Intel 2014

USA AZ Chandler
08 - IX - 2014
coll. Intel

SPARC M7
10000000000 T / 20 nm
Det. Oracle 2015

TW Hsinchu Baoshan
01 - X - 2015
coll. TSMC

Xeon Phi Knights Landing
8000000000 T / 14 nm
Det. Intel 2016

USA AZ Chandler
20-VI-2016
coll. Intel

AMD Epyc
19200000000 T / 14 nm
Det. AMD 2017

USA NY East Fishkill
20-VI-2017
coll. Global Foundries

Colossus Mk1 GC2
23700000000 T / 16 nm
Det. Graphcore 2018

TW Hsinchu Baoshan
01 - I - 2018
coll. TSMC

AMD Epyc Rome
39500000000 T / 7 nm
(TSMC)
Det. AMD 2019

TW Hsinchu Baoshan
7- VIII - 2019
coll. TSMC

Colossus Mk2 GC200
59400000000 T / 7 nm
(TSMC)
Det. Graphcore 2020

TW Hsinchu Baoshan
15 - VII - 2020
coll. TSMC

Apple M1 Max
57000000000 T / 5 nm
Det. Apple 2021

TW Hsinchu Baoshan
27 - 06 - 2021
coll. TSMC

Inanimate Species
A project by Joana Moll
2022

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