Request for Reconsideration after Final Action

The table below presents the data as entered.

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LITERAL ELEMENT	PRUSA PRO
STANDARD CHARACTERS	YES
USPTO-GENERATED IMAGE	YES
MARK STATEMENT	The mark consists of standard characters, without claim to any particular font style, size or color.
OWNER SECTION (current)	
NAME	Prusa Research s.r.o.
STREET	Partyzánská 188/7a
CITY	Praha 7, Holesovice
ZIP/POSTAL CODE	17000
COUNTRY/REGION/JURISDICTION/U.S. TERRITORY	Czech Republic
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NAME	Prusa Research s.r.o.
STREET	Partyzánská 188/7a
CITY	Praha 7, Holesovice
ZIP/POSTAL CODE	17000
COUNTRY/REGION/JURISDICTION/U.S. TERRITORY	Czech Republic
EMAIL	MSmisek@RRG.cz
ARGUMENT(S)	
Please see argument attached in the evidence section.	
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DESCRIPTION OF EVIDENCE FILE	Argument, evidence of secondary meaning under Section 2(f)
ADDITIONAL STATEMENTS SECTION	
SECTION 2(f) Claim of Acquired Distinctiveness, IN PART, BASED ON EVIDENCE	PRUSA has become distinctive of the goods/services, as demonstrated by the attached evidence.
2(f) EVIDENCE FILE NAME(S)	
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ATTORNEY INFORMATION (current)	
NAME	Nicholas D. Wells
ATTORNEY BAR MEMBERSHIP NUMBER	NOT SPECIFIED
YEAR OF ADMISSION	NOT SPECIFIED
U.S. STATE/ COMMONWEALTH/ TERRITORY	NOT SPECIFIED
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CITY	KAYSVILLE
STATE	Utah
POSTAL CODE	84037
COUNTRY/REGION/JURISDICTION/U.S. TERRITORY	United States
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EMAIL	nwells@legendslaw.com
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ATTORNEY BAR MEMBERSHIP NUMBER	XXX
YEAR OF ADMISSION	XXXX
U.S. STATE/ COMMONWEALTH/ TERRITORY	XX
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CITY	Kaysville
STATE	Utah
POSTAL CODE	84037
COUNTRY/REGION/JURISDICTION/U.S. TERRITORY	United States
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DOCKET/REFERENCE NUMBER	5855.207
OTHER APPOINTED ATTORNEY	Stephen H. Bean
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DOCKET/REFERENCE NUMBER	5855.207
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PRIMARY EMAIL ADDRESS FOR CORRESPONDENCE	nwells@legendslaw.com
SECONDARY EMAIL ADDRESS(ES) (COURTESY COPIES)	docket@legendslaw.com
DOCKET/REFERENCE NUMBER	5855.207
SIGNATURE SECTION	
DECLARATION SIGNATURE	/Nicholas Wells/
SIGNATORY'S NAME	Nicholas D. Wells
SIGNATORY'S POSITION	Attorney of record, Utah bar member
SIGNATORY'S PHONE NUMBER	8013374500
DATE SIGNED	02/24/2020
RESPONSE SIGNATURE	/Nicholas Wells/
SIGNATORY'S NAME	Nicholas D. Wells
SIGNATORY'S POSITION	Attorney of record, Utah Bar member
SIGNATORY'S PHONE NUMBER	8013374500
DATE SIGNED	02/24/2020
AUTHORIZED SIGNATORY	YES
CONCURRENT APPEAL NOTICE FILED	YES
FILING INFORMATION SECTION	
SUBMIT DATE	Mon Feb 24 17:14:41 ET 2020
TEAS STAMP	USPTO/RFR-XXXX:XXXX:XXX:X XXX:XXXX:XXXX:XXXX:XXXX-2 0200224171441162201-88163 892-71051f59c95eb89dd1289 e45e9c5338a0f935b34d2d453 167b078497bd57f2788-N/A-N /A-20200224170734261645

Request for Reconsideration after Final Action

To the Commissioner for Trademarks:

Application serial no. **88163892** PRUSA PRO(Standard Characters, see https://tmng-al.uspto.gov/resting2/api/img/88163892/large) has been amended as follows:

ARGUMENT(S)
In response to the substantive refusal(s), please note the following:

Please see argument attached in the evidence section.

EVIDENCE
Evidence in the nature of Argument, evidence of secondary meaning under Section 2(f) has been attached.
JPG file(s):
Evidence-1
Evidence-2
Evidence-3
Evidence-4
Original PDF file:
evi_26033026200fe00d149183efa094336-20200224170734261645_._200221_PRUSA_PRO_argument.pdf
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Evidence-1
Evidence-2
Evidence-3
Evidence-4
Evidence-5
Evidence-6
Evidence-7
Evidence-8
Evidence-9
Evidence-10
Evidence-11
Evidence-12
Evidence-13
Evidence-14
Evidence-15
Evidence-16
Evidence-17
Evidence-18
Original PDF file:
evi_26033026200fe00d149183efa094336-20200224170734261645_._pcoming_events_-_Prusa3D_-_3D_Printers_from_Josef_Pr__367__a.pdf
Converted PDF file(s) (10 pages)
Evidence-1
Evidence-2
Evidence-3
Evidence-4
Evidence-5
Evidence-6
Evidence-7
Evidence-8
Evidence-9
Evidence-10
Original PDF file:
evi_26033026200fe00d149183efa094336-20200224170734261645_._YouTube_screen_captures.pdf
Converted PDF file(s) (5 pages)
Evidence-1
Evidence-2
Evidence-3
Evidence-4
Evidence-5

Owner AND/OR ENTITY INFORMATION
Applicant proposes to amend the following:
Current: Prusa Research s.r.o., a limited liability company legally organized under the laws of Czech Republic, having an address of
Partyzánská 188/7a
Praha 7, Holesovice, 17000
Czech Republic

Proposed: Prusa Research s.r.o., a limited liability company legally organized under the laws of Czech Republic, having an address of
Partyzánská 188/7a
Praha 7, Holesovice, 17000
Czech Republic
Email Address: MSmisek@RRG.cz

The owner's/holder's current attorney information: Nicholas D. Wells. Nicholas D. Wells of LEGENDS LAW GROUP, PLLC, is located at

330 N. MAIN ST.
KAYSVILLE, Utah 84037

United States
The docket/reference number is 5855.207.

The phone number is 801-337-4500.

The email address is nwells@legendslaw.com

The owner's/holder's proposed attorney information: Nicholas D. Wells. Other appointed attorneys are Stephen H. Bean. Nicholas D. Wells of Legends Law Group, PLLC, is a member of the XX bar, admitted to the bar in XXXX, bar membership no. XXX, and the attorney(s) is located at

330 Main St.
Kaysville, Utah 84037
United States
The docket/reference number is 5855.207.

The phone number is 801-337-4500.

The email address is nwells@legendslaw.com

Nicholas D. Wells submitted the following statement: The attorney of record is an active member in good standing of the bar of the highest court of a U.S. state, the District of Columbia, or any U.S. Commonwealth or territory.

Correspondence Information (current):
NICHOLAS D. WELLS
PRIMARY EMAIL FOR CORRESPONDENCE: nwells@legendslaw.com
SECONDARY EMAIL ADDRESS(ES) (COURTESY COPIES): docket@legendslaw.com

The docket/reference number is 5855.207.

Correspondence Information (proposed):
Nicholas D. Wells
PRIMARY EMAIL FOR CORRESPONDENCE: nwells@legendslaw.com
SECONDARY EMAIL ADDRESS(ES) (COURTESY COPIES): docket@legendslaw.com

The docket/reference number is 5855.207.

Requirement for Email and Electronic Filing: I understand that a valid email address must be maintained by the owner/holder and the owner's/holder's attorney, if appointed, and that all official trademark correspondence must be submitted via the Trademark Electronic Application System (TEAS).

ADDITIONAL STATEMENTS
SECTION 2(f) Claim of Acquired Distinctiveness, IN PART, BASED ON EVIDENCE
PRUSA has become distinctive of the goods/services, as demonstrated by the attached evidence.

Original PDF file:
epart-26033026200fe00d149183efa094336-170734261_._See_argument.pdf
Converted PDF file(s) (1 page)
2(f) evidence-1

SIGNATURE(S)
Declaration Signature

DECLARATION: The signatory being warned that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and that such willful false statements and the like may jeopardize the validity of the application or submission or any registration resulting therefrom, declares that, if the applicant submitted the application or allegation of use (AOU) unsigned, all statements in the application or AOU and this submission based on the signatory's own knowledge are true, and all statements in the application or AOU and this submission made on information and belief are believed to be true.

STATEMENTS FOR UNSIGNED SECTION 1(a) APPLICATION/AOU: If the applicant filed an unsigned application under 15 U.S.C.

§1051(a) or AOU under 15 U.S.C. §1051(c), the signatory additionally believes that: the applicant is the owner of the mark sought to be registered; the mark is in use in commerce and was in use in commerce as of the filing date of the application or AOU on or in connection with the goods/services/collective membership organization in the application or AOU; the original specimen(s), if applicable, shows the mark in use in commerce as of the filing date of the application or AOU on or in connection with the goods/services/collective membership organization in the application or AOU; ***for a collective trademark, collective service mark, collective membership mark application, or certification mark application,*** the applicant is exercising legitimate control over the use of the mark in commerce and was exercising legitimate control over the use of the mark in commerce as of the filing date of the application or AOU; ***for a certification mark application,*** the applicant is not engaged in the production or marketing of the goods/services to which the mark is applied, except to advertise or promote recognition of the certification program or of the goods/services that meet the certification standards of the applicant. **To the best of the signatory's knowledge and belief, no other persons, except, if applicable, authorized users, members, and/or concurrent users, have the right to use the mark in commerce, either in the identical form or in such near resemblance as to be likely, when used on or in connection with the goods/services/collective membership organization of such other persons, to cause confusion or mistake, or to deceive.**

STATEMENTS FOR UNSIGNED SECTION 1(b)/SECTION 44 APPLICATION AND FOR SECTION 66(a) COLLECTIVE/CERTIFICATION MARK APPLICATION: If the applicant filed an unsigned application under 15 U.S.C. §§ 1051(b), 1126(d), and/or 1126(e), or filed a collective/certification mark application under 15 U.S.C. §1141f(a), the signatory additionally believes that: ***for a trademark or service mark application,*** the applicant is entitled to use the mark in commerce on or in connection with the goods/services specified in the application; the applicant has a bona fide intention to use the mark in commerce and had a bona fide intention to use the mark in commerce as of the application filing date; ***for a collective trademark, collective service mark, collective membership mark, or certification mark application,*** the applicant has a bona fide intention, and is entitled, to exercise legitimate control over the use of the mark in commerce and had a bona fide intention, and was entitled, to exercise legitimate control over the use of the mark in commerce as of the application filing date; the signatory is properly authorized to execute the declaration on behalf of the applicant; ***for a certification mark application,*** the applicant will not engage in the production or marketing of the goods/services to which the mark is applied, except to advertise or promote recognition of the certification program or of the goods/services that meet the certification standards of the applicant. **To the best of the signatory's knowledge and belief, no other persons, except, if applicable, authorized users, members, and/or concurrent users, have the right to use the mark in commerce, either in the identical form or in such near resemblance as to be likely, when used on or in connection with the goods/services/collective membership organization of such other persons, to cause confusion or mistake, or to deceive.**

Signature: /Nicholas Wells/ Date: 02/24/2020
Signatory's Name: Nicholas D. Wells
Signatory's Position: Attorney of record, Utah bar member
Signatory's Phone Number: 8013374500

Request for Reconsideration Signature
Signature: /Nicholas Wells/ Date: 02/24/2020
Signatory's Name: Nicholas D. Wells
Signatory's Position: Attorney of record, Utah Bar member

Signatory's Phone Number: 8013374500

The signatory has confirmed that he/she is a U.S.-licensed attorney who is an active member in good standing of the bar of the highest court of a U.S. state (including the District of Columbia and any U.S. Commonwealth or territory); and he/she is currently the owner's/holder's attorney or an associate thereof; and to the best of his/her knowledge, if prior to his/her appointment another U.S.-licensed attorney not currently associated with his/her company/firm previously represented the owner/holder in this matter: the owner/holder has revoked their power of attorney by a signed revocation or substitute power of attorney with the USPTO; the USPTO has granted that attorney's withdrawal request; the owner/holder has filed a power of attorney appointing him/her in this matter; or the owner's/holder's appointed U.S.-licensed attorney has filed a power of attorney appointing him/her as an associate attorney in this matter.

The applicant is filing a Notice of Appeal in conjunction with this Request for Reconsideration.

Mailing Address: NICHOLAS D. WELLS
LEGENDS LAW GROUP, PLLC

330 N. MAIN ST.
KAYSVILLE, Utah 84037
Mailing Address: Nicholas D. Wells
Legends Law Group, PLLC
330 Main St.

Kaysville, Utah 84037

Serial Number: 88163892
Internet Transmission Date: Mon Feb 24 17:14:41 ET 2020
TEAS Stamp: USPTO/RFR-XXXX:XXXX:XXX:XXXX:XXXX:XXXX:X
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4170734261645

Mark: **PRUSA PRO**

Serial No. **88163892**

Filing date: **October 22, 2018**

Applicant's PRUSA PRO mark has been finally refused registration based on the mark allegedly being merely descriptive under Section 2(e)(4) as merely a surname. The conclusion of the Examining Attorney appears to rest on the fact that, despite being a rare surname when viewed in light of prior cases addressing refusals under Section 2(e)(4), the surname PRUSA is in fact the surname of a principal of the Applicant. The Examining Attorney thus suggests that consumers are likely to associate the surname PRUSA primarily with the person of Josef Prusa rather than viewing the word PRUSA as a trademark associated with goods and services provided by applicant Prusa Research. Applicant respectfully disagrees.

The admitted fame of Applicant's principal, Josef Prusa, within the 3D printing industry, actually contributes to the fact that consumers are likely to view the word PRUSA as associated not with the person of Josef Prusa, but with products sold by Josef Prusa through his company, Prusa Research.

This is analogous to a famous clothing designer, such as Ralph Lauren. When consumers see a clothing item with the trademark LAUREN, they are likely to view this as associated with a clothing company operated by Ralph Lauren, rather than merely as a reference to a person having the surname Lauren. Similarly, persons who are familiar with the 3D printing industry are likely to know of Mr. Josef Prusa. However, they know the name of Mr. Josef Prusa *because* he is known as the principal of a company that manufactures and sells 3D printers and associated goods and services. Thus, consumers will associate the term PRUSA not merely with Mr. Josef

Prusa but will instead think of goods and services provided by a company run by Mr. Josef Prusa. The facts presented below as to the term PRUSA having acquired secondary meaning as a trademark support this view.

In support of the analogy between Ralph Lauren and Josef Prusa, Applicant submits copies showing Josef Prusa as one of Forbes Magazine's "30 Under 30" profiles of leaders in European technology in 2018, as well as a profile from the MIT Technology Review that highlights Josef Prusa as one of the leading "Innovators Under 35." The website Forbes.com is reported as having over 74 million unique visitors each month. (*See* attached screen capture regarding the reach of Forbes.com in the "Analytics data" PDF, and the Wikipedia articles about Forbes magazine.)

Applicant has in a previous response noted that Prusa is a very rare surname in the United States, such that Applicant believes a refusal under Section 2(e)(4) is inappropriate solely based on the rareness of the surname. However, Applicant further asserts that the rareness of the surname means that the term PRUSA has more easily gained secondary meaning as a trademark because consumers are less likely to have mental associations of Prusa as a surname. Thus, Applicant asserts that while a larger body of evidence might be required to support an assertion that a more common surname such as JENSEN or CLARK has acquired secondary meaning as a trademark, the evidence provided with this response is fully sufficient to demonstrate acquired distinctiveness given the rareness of Prusa as a surname.

As background, Applicant notes that the 3D printing industry as currently known is a fairly recent development. 3D printing is a process in which a three-dimensional object is created ("printed") from a computer-aided design (CAD) model by successively adding material layer by layer. The material that is added is often a semi-liquid plastic resin or similar substance which can flow through a nozzle, with the position of the nozzle being controlled in the manner of computer-controlled manufacturing equipment. 3D printing is a type of additive manufacturing. This contrasts with conventional machining, casting and forging processes, where material is removed from a stock item (subtractive manufacturing) or poured into a mold and shaped by means of dies, presses and hammers. *See* attached Wikipedia article on 3D printing.

A variety of technologies are used within the 3D printing industry, which, according to a Forbes article in 2018, is now over $7 billion annually. Small desktop printers are used to create machine parts from metal powder or resin filaments; larger printers are used for custom manufacturing and prototyping; giant printers that extrude concrete have even been used to create buildings.

Applicant Prusa Research was founded in 2012 by Josef Prusa and focuses on the market for small 3D printers. According to a Forbes article in 2018, about 250,000 desktop 3D printers are sold each year.

Applicant here asserts that the word PRUSA as found within Applicant's mark has acquired secondary meaning as a trademark under Section 2(f) of the Act through the widespread use of the word PRUSA in commerce in the United States since at least as early as mid-2017.

Please note that Applicant uses the word PRUSA in connection with multiple trademarks through its business operations, including PRUSA (as a single word), PRUSA RESEARCH, ORIGINAL PRUSA, PRUSA ORANGE, PRUSA POLYMERS, PRUSAMENT, and others. Applicant also intends to use the term PRUSA in other marks that are not yet used in commerce in the United States, such as PRUSA PRO and PRUSA 3D. However, because the present refusal relates to the assertion by the Examining Attorney that PRUSA is a merely descriptive *element* of Applicant's mark, Applicant asserts that the evidence provided in this response as to the use of PRUSA and PRUSA-formative marks is relevant as to all of Applicant's marks that include the word PRUSA, including the mark that is the subject of the present refusal.

The following facts, supported by the attached evidence and declaration, show that the word PRUSA has acquired secondary meaning as a trademark under Section 2(f) of the Act.

1. The worldwide market share of Prusa Research for 3D printers is approximately 18%. (*See* Prusa Declaration.)

2. The market share of Prusa Research for 3D printers within the United States is approximately 10%. (*See* Prusa Declaration.)

3. To date, Prusa Research has sold approximately 50,000 (fifty-thousand) 3D printers to customers in the States. (*See* Prusa Declaration.) Prusa Research has sold 3D printers to consumers throughout the United States. (*See* image of map showing markers to indicate the locations where Prusa Research has shipped its 3D printers within the United States, in the "Analytics data" PDF.)

4. To date, Prusa Research has sold approximately $ 42 million worth of goods to customers in the United States. (*See* Prusa Declaration.)

5. As of late 2019, the monthly revenue received by Prusa Research from sales to customers in the United States is approximately $ 2 million. (*See* Prusa Declaration.)

6. As of late 2019, monthly revenue for sale of 3D printing filament branded with a PRUSA-formative trademark and sold solely through Amazon.com is approximately $65-80,000.

(*See* Amazon sales page showing PRUSA ORANGE filament and related sales data screen, in the "Prusa Orange images" PDF.)

7. As of late 2019, approximately 30% of the internet traffic coming to websites operated by Prusa Research originates from internet users located in the United States. *See* Prusa Declaration, and Google Analytics data screen in the "Analytics data" PDF, which shows approximately recent 165,000 website visitors from the United States directly to websites operated by Applicant.

8. Prusa Research uses Google Ads as a means of reaching potential customers. Analytics data provided by Google Ads for the 6-week period from January 1, 2020 through February 19, 2020 shows 2.053 million impressions to customers located in the United States and 241,000 click-throughs on the ads shown to potential customers within the United States. (*See* the "Analytics data" PDF)

9. As of late 2019, Prusa Research manufactures at its factory in Prague, Czech Republic, approximately 450 (four-hundred-fifty) 3D printers each business day. (*See* Prusa Declaration. *See also* PDF article "Fabbaloo-Prusa's Manufacturing Capacity Is Incredible")

10. As of late 2019, Prusa Research employs approximately 300 people. (*See* Prusa Declaration.)

11. The consulting and accounting firm of Deloitte declared Prusa Research the Number 1 fastest growing technology company in Central Europe. (*See* Prusa Declaration.) While this fact is not directly relevant to Applicant's mark acquiring secondary meaning in the United States, Applicant submits that Applicant's prominence and growth within Europe is a

factor that supports a conclusion that Applicant is experiencing strong growth and is likely to be well-known within the 3D printing industry.

12. PRUSA POLYMERS is a trademark that is used by Prusa Research in connection with the sale of supplies for 3D printers, and especially for filament used for 3D printing. (*See* Prusa Declaration.)

13. To date, Prusa Research has shipped approximately 100,000 (one-hundred-thousand) spools of filament for use with 3D printers to customers located in the United States. (*See* Prusa Declaration. See also product photos in the "Applicant goods and website" PDF.)

14. Prusa Research, as a company, typically participates in or attends annually between 2 and 5 trade shows or conferences held in the United States. Prusa Research also attends numerous trade shows and conferences in other countries each year. Applicant submits that attendance at events outside the United States also tends to raise the prominence of Applicant within the entire 3D printing industry, in a manner that tends to increase Applicant's visibility to U.S.-based consumers. (*See* Prusa Declaration. *See also* PDF printout of recent events and trade shows attended in the "Applicant goods and website" PDF.)

15. The 3D printer sold under the trademark ORIGINAL PRUSA has won numerous industry awards and is widely considered a leading product in the 3D printing industry, including by consumers of 3D printing products in the United States. (*See* Prusa Declaration. *See also* printouts of details for multiple industry and media awards received by the ORIGINAL PRUSA printer produced by PRUSA RESEARCH in the "Awards and Reviews" PDF.)

16. The ORIGINAL PRUSA brand of 3D printer includes components that are bright orange in color. This bright orange color has become known throughout the 3D printing industry as a characteristic feature of 3D printers sold by Prusa Research. (*See* Prusa Declaration. See also examples of queries from customers and potential customers to ask specifically about PRUSA ORANGE in reference to Applicant's products in the "Prusa Orange Images" PDF.)

17. Prusa Research sells filament for use with 3D printers under the trademark PRUSAMENT, with the broader brand being PRUSA POLYMERS. (*See* Prusa Declaration. *See also* examples of printouts of web pages where 3D printer filament is sold in the "Prusa Orange Images" PDF.)

18. The trademark PRUSA ORANGE is used in connection with the sale of filament for 3D printers that is a particular shade of bright orange that is known in the 3D printing industry as being associated with products from Prusa Research. (*See* Prusa Declaration. See also examples of queries from customers and potential customers to ask specifically about PRUSA ORANGE in reference to Applicant's products in the "Prusa Orange Images" PDF.)

19. Users of 3D printers frequently ask by name for 3D printer filament that is colored PRUSA ORANGE, because of the distinctive characteristic of this bright orange color when used in connection with products for 3D printing. *See* screen captures of multiple users posing questions about PRUSA ORANGE products, as well as product pages where products are offered for sale that are identified as being PRUSA ORANGE in the "Prusa Orange Images" PDF.

20. The 3D printers currently sold by Prusa Research are generally considered to be for home, hobby, or educational use and are not considered to be for professional use because such 3D printers are priced under $1,000. (*See* Prusa Declaration.)

21. Prusa Research currently plans to release in late 2020 a higher-end 3D printer that will target the professional printer market at a higher price point. The trademark PRUSA PRO will be used in connection with this professional-level printer. (*See* Prusa Declaration.)

22. In September 2019, Prusa Research established a world record by operating 1096 3D printers at the same time (*See* attached article about the world record-setting activity).

23. Prusa Research has participated multiple times with a booth at the Consumer Electronics Show ("CES") in Las Vegas, which is one of the largest U.S. trade shows with annual attendance of approximately 182,000 people. *See* clips from a video interview occurring at the 2017 CES trade show and booth photos from the 2017 CES show which show the PRUSA RESEARCH trademark used prominently within the CES booth, in the "YouTube Screen Captures" PDF.

24. Awards that Applicant Prusa Research has received within the 3D printing industry include, without limitation, the following (*see* the "Awards and Reviews" PDF unless otherwise noted):

a. 3D Printing Industry Awards 2018, award for Personal 3D Printer of the Year for the Original Prusa i3 MK3. *See* 3D Printing Industry Awards 2018, page 26 in PDF.

b. 3D Printing Industry Awards 2018, shortlisted nominee for Best 3D Printing Company to Work For, to Prusa Research. *See* 3D Printing Industry Awards 2018, page 28 in PDF.

c. 3D Printing Industry Awards 2019, award for Desktop FFF 3D Printer of the Year to the Original Prusa i3 MK3. *See* 3D Printing Industry Awards 2019, page 9 of PDF.

d. All3DP award in 2017 for Best 3D Printer Kit for the Original Prusa i3 MK2.

   i. The website all3dp.com has approximately 578,000 visitors each month. Approximately 29% of these visitors originate in the United States. *See* statistical summary screen for all3dp.com in the "Analytics data" PDF.

e. Aniwaa.com awarded the top place in the list of 10 Best 3D Printers in 2020 to the Original Prusa i3 MK3

f. Make Magazine awarded the leading position in its 3D Printer Buyer Guide, along with the cover story of the relevant issue of the magazine, to the Original Prusa i3 MK2S printer. *See* printout of magazine cover and web page screen capture.

25. Products of Prusa Research have been reviewed by virtually all leading publications in the 3D printing industry and many technology and business publications. The following examples are provided, with comments on the reach of certain reviews (*see* the "Awards and Reviews" PDF unless otherwise noted):

a. Forbes article from January 8, 2020, The Best 3D Printers of 2020, lists Original Prusa i3 MK3 on page 2

i. Forbes is a general business publication with biweekly circulation, as of 2013, of approximately 931,000 readers. See Wikipedia article on Forbes. Forbes.com is reported as one of the most widely visited business web sites with more than 74 million monthly unique visitors in the United States. *See* the "Analytics data" PDF.

b. TechRadar provided a review in May 2019 of the Original Prusa i3 MK3S printer of Prusa Research.

i. The website techradar.com has approximately 8.8 million visitors each month. Approximately 32% of these visitors originate in the United States. *See* the "Analytics data" PDF.

c. Medium.com reviewed Applicant's 3D printer under the headline "Is Prusa's i3 MK3 The Tesla of Under-$1000 3D Printers?" (*See* attached review.)

a. 3DPrinting.com posted a product review in 2017 of the Original Prusa 3D printer (*See* attached review).

b. 3D Hubs, in its "best 3D Printer Guide 2019," naming the Original Prusa printer as the "Best Home 3D Printer" (*See* attached review).

c. 3D Insider reviewed the Original Prusa i3 MK3 printer (*See* attached review).

d. 3DPrint.com reviewed the Original Prusa i3 MK3, in a post that was dated September 25, 2017 (*See* attached review).

e. The 3D printing news website Fabbaloo.com has posted numerous articles about Prusa Research and its products. The site once called Prusa Research "one of the most interesting companies in the 3D print space."

f. Windows Central reviewed the Original Prusa i3 MK3 and called it "the best 3D Printer you can buy for under $1000" (*See* attached review).

   a. The website windowscentral.com has approximately 1.88 million visitors each month. Approximately 30% of these visitors originate in the United States. *See* the "Analytics data" PDF.

26. The products of Applicant Prusa Research have been reviewed and discussed by numerous the leading commentators in the 3D printing industry. The following examples are provided, with comments on the reach of these reviews. In each case, screen captures in the "YouTube Screen Captures" PDF are attached to show the indicated facts:

a. YouTube commentator: 3D Printing Nerd, 374,000 YouTube subscribers
   i. Video tour of Prusa Research factory, viewed 298,000 times
b. YouTube commentator: 3DMN, 57,900 YouTube subscribers
   i. Review of Original Prusa i3 MK3 printer, viewed 117,000 times
c. YouTube commentator: GreatScott, 1.28 million YouTube subscribers
   i. Review of Original Prusa i3 MK3 printer, viewed 617,000 times
d. YouTube commentator: MakersMuse, 557,000 YouTube subscribers
   i. Review of Original Prusa i3 MK3 printer, viewed 236,000 times
e. YouTube commentator: Thomas Sanladerer, 267,000 YouTube subscribers
   i. Review of Original Prusa i3 MK3 printer, viewed 416,000 times
   ii. Titled "The most important 3D printer" and states "The Original Prusa MK3 might well be the most impactful 3D printer on the market right now"

27. A further video clip posted by Prusa Research itself, which discusses the topic of whether the Original Prusa 3D printer was used in connection with the creation of Star Wars films, has been viewed almost 39,000 times. *See* attached screen capture from YouTube.

28. Social media accounts of Prusa Research and the use of PRUSA within hashtags on social media platforms is extensive, as shown by the following details (*See* generally the "Social Media images" PDF unless otherwise noted):

    a. The @prusament handle on Instagram, which is operated by the PRUSA POLYMERS division of Applicant and is focused on promotion of the sale of 3D printer filaments under the PRUSAMENT and PRUSA POLYMERS marks, has over 16,000 followers. (*See* attached screen capture.)

    b. The #Prusa hashtag has over 88,000 posts on Instagram. The vast majority of these are clearly related to 3D printing activities. (*See* attached screen capture.)

    c. The #Prusa3D hashtag has over 4,800 posts on Instagram. The vast majority of these are clearly related to 3D printing activities. (*See* attached screen capture.)

    d. The #Prusai3 hashtag has over 58,000 posts on Instagram. The name Prusa i3 MK3 is the name of Applicant's market-leading printer. (*See* attached screen capture.)

e. The #Prusaimk3 hashtag has over 34,000 posts on Instagram. The name Prusa i3 MK3 is the name of Applicant's market-leading printer. (*See* attached screen capture.)

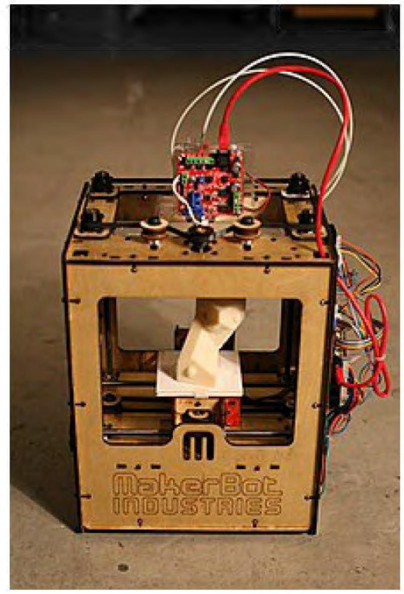
f. The @PrusaPolymers Facebook page, which also uses the title Prusament, is followed by over 1,000 people. (*See* attached screen capture.)

g. The #Prusa hashtag on the short video site TikTok includes videos with approximately 1.4 million total views. The vast majority of these are clearly related to 3D printing activities. (*See* attached screen capture.)

In summary, Applicant is a market leader that is widely recognized in the U.S. market. Virtually any potential consumer who is considering the purchase of a 3D printer at a price point under $1000 will encounter numerous reviews, advertisements, and comments regarding Applicant's goods and services under a PRUSA-formative trademark, and in particular, the marks PRUSA RESEARCH and ORIGINAL PRUSA. The fame of Applicant's founder, Mr. Josef Prusa, merely contributes to the trademark significance of the term PRUSA because Mr. Josef Prusa is known as the founder of a company that provides goods and services in the 3D printing industry. Thus, the term PRUSA has acquired secondary meaning as a trademark under Section 2(f) of the Act and the refusal to register Applicant's mark under Section 2(e)(4) should be withdrawn and Applicant's mark passed for publication.

WIKIPEDIA

3D printing



A three-dimensional printer

The **3D printing** process builds a three-dimensional object from a computer-aided design (CAD) model, usually by successively adding material layer by layer, which is why it is also called **additive manufacturing**,[1] unlike conventional machining, casting and forging processes, where material is removed from a stock item (subtractive manufacturing) or poured into a mold and shaped by means of dies, presses and hammers.[2][3]

The term "3D printing" covers a variety of processes in which material is joined or solidified under computer control to create a three-dimensional object,[4] with material being added together (such as liquid molecules or powder grains being fused together), typically layer by layer. In the 1990s, 3D-printing techniques were considered suitable only for the production of functional or aesthetic prototypes and a more appropriate term for it was rapid prototyping.[5] As of 2019 the precision, repeatability and material range have increased to the point that some 3D-printing processes are considered viable as an industrial-production technology, whereby the term **additive manufacturing** can be used synonymously with "3D printing". One of the key advantages of 3D printing is the ability to produce very complex shapes or geometries, and a prerequisite for producing any 3D printed part is a digital 3D model or a CAD file.

The most-commonly used 3D-printing process (46% as of 2018) is a material extrusion technique called fused deposition modeling (FDM).[6] While FDM technology was invented after the other two most popular technologies, stereolithography (SLA), and selective laser sintering (SLS); FDM is typically the most inexpensive of the three by a large margin, which lends to the popularity of the process.

The term "3D printing" originally referred to a process that deposits a binder material onto a powder bed with inkjet printer heads layer by layer. More recently, the popular vernacular has started using the term to encompass a wider variety of additive-manufacturing techniques such as electron-beam additive manufacturing and selective laser melting. The United States and global technical standards use the official term *additive manufacturing* for this broader sense.

Contents

Terminology

The umbrella term *additive manufacturing (AM)* gained popularity in the 2000s,[7] inspired by the theme of material being added together (in any of various ways). In contrast, the term *subtractive manufacturing* appeared as a retronym for the large family of machining processes with material *removal* as their common theme. The term *3D printing* still referred only to the polymer technologies in most minds, and the term *AM* was more likely to be used in metalworking and end use part production contexts than among polymer, ink-jet, or stereo lithography enthusiasts.

By early 2010s, the terms *3D printing* and *additive manufacturing* evolved senses in which they were alternate umbrella terms for additive technologies, one being used in popular language by consumer-maker communities and the media, and the other used more formally by industrial end-use part producers, machine manufacturers, and global technical standards organizations. Until recently, the term *3D printing* has been associated with machines low in price or in capability.[8] *3D printing* and *additive manufacturing* reflect that the technologies share the theme of material addition or joining throughout a 3D work envelope under automated control. Peter Zelinski, the editor-in-chief of *Additive Manufacturing* magazine, pointed out in 2017 that the terms are still often synonymous in casual usage[9] but some manufacturing industry experts are trying to make a distinction whereby Additive Manufacturing comprises 3D printing plus other technologies or other aspects of a manufacturing process.[9]

Other terms that have been used as synonyms or hypernyms have included *desktop manufacturing*, *rapid manufacturing* (as the logical production-level successor to *rapid prototyping*), and *on-demand manufacturing* (which echoes *on-demand printing* in the 2D sense of *printing*). Such application of the adjectives *rapid* and *on-demand* to the noun *manufacturing* was novel in the 2000s reveals the prevailing mental model of the long industrial era in which almost all production manufacturing involved long lead times for laborious tooling development. Today, the term *subtractive* has not replaced the term *machining*, instead complementing it when a term that covers any removal method is needed. Agile tooling is the use of modular means to design tooling that is produced by additive manufacturing or 3D printing methods to enable quick prototyping and responses to tooling and fixture needs. Agile tooling uses a cost-effective and high-quality method to quickly respond to customer and market needs, and it can be used in hydro-forming, stamping, injection molding and other manufacturing processes.

History

1970s

In 1974, David E. H. Jones laid out the concept of 3D printing in his regular column *Ariadne* in the journal New Scientist[10][11]

1980s

Early additive manufacturing equipment and materials were developed in the 1980s.[12] In 1981, Hideo Kodama of Nagoya Municipal Industrial Research Institute invented two additive methods for fabricating three-dimensional plastic models with photo-hardening thermoset polymer, where the UV exposure area is controlled by a mask pattern or a scanning fiber transmitter.[13][14]

On July 2, 1984, American entrepreneur Bill Masters filed a patent for his Computer Automated Manufacturing Process and System (US 4665492 (https://patents.google.com/patent/US4665492)).[15] This filing is on record at the USPTO as the first 3D printing patent in history; it was the first of three patents belonging to Masters that laid the foundation for the 3D printing systems used today.[16][17]

On 16 July 1984, Alain Le Méhauté, Olivier de Witte, and Jean Claude André filed their patent for the stereolithography process.[18] The application of the French inventors was abandoned by the French General Electric Company (now Alcatel-Alsthom) and CILAS (The Laser Consortium).[19] The claimed reason was "for lack of business perspective".[20]

Three weeks later in 1984, Chuck Hull of 3D Systems Corporation[21] filed his own patent for a stereolithography fabrication system, in which layers are added by curing photopolymers with ultraviolet light lasers. Hull defined the process as a "system for generating three-dimensional objects by creating a cross-sectional pattern of the object to be formed,".[22][23] Hull's contribution was the STL (Stereolithography) file format and the digital slicing and infill strategies common to many processes today.

In 1986, Charles "Chuck" Hull was granted a patent for his system, and his company, 3D Systems Corporation released the first commercial 3D printer, the SLA-1.[24]

The technology used by most 3D printers to date—especially hobbyist and consumer-oriented models —is fused deposition modeling, a special application of plastic extrusion, developed in 1988 by S. Scott Crump and commercialized by his company Stratasys, which marketed its first FDM machine in 1992.

1990s

AM processes for metal sintering or melting (such as selective laser sintering, direct metal laser sintering, and selective laser melting) usually went by their own individual names in the 1980s and 1990s. At the time, all metalworking was done by processes that are now called non-additive (casting, fabrication, stamping, and machining); although plenty of automation was applied to those technologies (such as by robot welding and CNC), the idea of a tool or head moving through a 3D work envelope transforming a mass of raw material into a desired shape with a toolpath was associated in metalworking only with processes that removed metal (rather than adding it), such as CNC milling, CNC EDM, and many others. But the automated techniques that *added* metal, which would later be called additive manufacturing, were beginning to challenge that assumption. By the mid-1990s, new techniques for material deposition were developed at Stanford and Carnegie Mellon University, including microcasting[25] and sprayed materials.[26] Sacrificial and support materials had also become more common, enabling new object geometries.[27]

The term *3D printing* originally referred to a powder bed process employing standard and custom inkjet print heads, developed at MIT by Emanuel Sachs in 1993 and commercialized by Soligen Technologies, Extrude Hone Corporation, and Z Corporation.

The year 1993 also saw the start of a company called Solidscape, introducing a high-precision polymer jet fabrication system with soluble support structures, (categorized as a "dot-on-dot" technique).

In 1995 the Fraunhofer Society developed the selective laser melting process.

2000s

Fused Deposition Modeling (FDM) printing process patents expired in 2009.[28]

2010s

As the various additive processes matured, it became clear that soon metal removal would no longer be the only metalworking process done through a tool or head moving through a 3D work envelope transforming a mass of raw material into a desired shape layer by layer. The 2010s were the first decade in which metal end use parts such as engine brackets[29] and large nuts[30] would be grown (either before or instead of machining) in job production rather than obligately being machined from bar stock or plate. It is still the case that casting, fabrication, stamping, and machining are more prevalent than additive manufacturing in metalworking, but AM is now beginning to make significant inroads, and with the advantages of design for additive manufacturing, it is clear to engineers that much more is to come.

As technology matured, several authors had begun to speculate that 3D printing could aid in sustainable development in the developing world.[31]

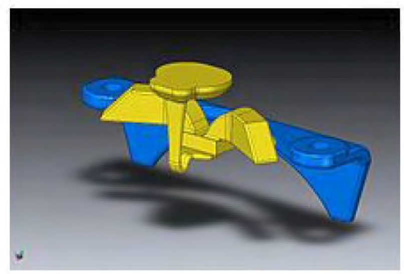
In 2012, Filabot developed a system for closing the loop[32] with plastic and allows for any FDM or FFF 3D printer to be able to print with a wider range of plastics.

In 2014, Benjamin S. Cook and Manos M. Tentzeris demonstrate the first multi-material, vertically integrated printed electronics additive manufacturing platform (VIPRE) which enabled 3D printing of functional electronics operating up to 40 GHz.[33]

General principles

Modeling

3D printable models may be created with a computer-aided design (CAD) package, via a 3D scanner, or by a plain digital camera and photogrammetry software. 3D printed models created with CAD result in reduced errors and can be corrected before printing, allowing verification in the design of the object before it is printed.[34] The manual modeling process of preparing geometric data for 3D computer graphics is similar to plastic arts such as sculpting. 3D scanning is a process of collecting digital data on the shape and appearance of a real object, creating a digital model based on it.



CAD model used for 3D printing

CAD models can be saved in the stereolithography file format (STL), a de facto CAD file format for additive manufacturing that stores data based on triangulations of the surface of CAD models. STL is not tailored for additive manufacturing because it generates large file sizes of topology optimized parts and lattice structures due to the large number of surfaces involved. A newer CAD file format, the Additive Manufacturing File format (AMF) was introduced in 2011 to solve this problem. It stores information using curved triangulations.[35]

3D models can be generated from 2D pictures taken at a 3D photo booth.

Printing

Before printing a 3D model from an STL file, it must first be examined for errors. Most CAD applications produce errors in output STL files,[36][37] of the following types:

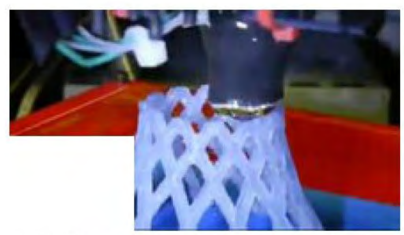
1. holes;
2. faces normals;
3. self-intersections;
4. noise shells;
5. manifold errors.[38]

A step in the STL generation known as "repair" fixes such problems in the original model.[39][40] Generally STLs that have been produced from a model obtained through 3D scanning often have more of these errors.[41] This is due to how 3D scanning works-as it is often by point to point acquisition, 3D reconstruction will include errors in most cases.[42]

Once completed, the STL file needs to be processed by a piece of software called a "slicer," which converts the model into a series of thin layers and produces a G-code file containing instructions tailored to a specific type of 3D printer (FDM printers).[43] This G-code file can then be printed with 3D printing client software (which loads the G-code, and uses it to instruct the 3D printer during the 3D printing process).

Printer resolution describes layer thickness and X–Y resolution in dots per inch (dpi) or micrometers (µm). Typical layer thickness is around 100 µm (250 DPI), although some machines can print layers as thin as 16 µm (1,600 DPI).[44] X–Y resolution is comparable to that of laser printers. The particles (3D dots) are around 50 to 100 µm (510 to 250 DPI) in diameter. For that printer resolution, specifying a mesh resolution of 0.01–0.03 mm and a chord length ≤ 0.016 mm generate an optimal STL output file for a given model input file.[45] Specifying higher resolution results in larger files without increase in print quality.

Construction of a model with contemporary methods can take anywhere from several hours to several days, depending on the method used and the size and complexity of the model. Additive systems can typically reduce this time to a few hours, although it varies widely depending on the type of machine used and the size and number of models being produced simultaneously.[46]



3:31 Timelapse of an 80-minute video of an object being made out of PLA using molten polymer deposition

Traditional techniques like injection moulding can be less expensive for manufacturing polymer products in high quantities, but additive manufacturing can be faster, more flexible and less expensive when producing relatively small quantities of parts. 3D printers give designers and concept development teams the ability to produce parts and concept models using a desktop size printer.[47]

Finishing

Though the printer-produced resolution is sufficient for many applications, greater accuracy can be achieved by printing a slightly oversized version of the desired object in standard resolution and then removing material using a higher-resolution subtractive process.[48]

The layered structure of all Additive Manufacturing processes leads inevitably to a strain-stepping effect on part surfaces which are curved or tilted in respect to the building platform. The effects strongly depend on the orientation of a part surface inside the building process.[49]

Some printable polymers such as ABS, allow the surface finish to be smoothed and improved using chemical vapor processes[50] based on acetone or similar solvents.

Some additive manufacturing techniques are capable of using multiple materials in the course of constructing parts. These techniques are able to print in multiple colors and color combinations simultaneously, and would not necessarily require painting.

Some printing techniques require internal supports to be built for overhanging features during construction. These supports must be mechanically removed or dissolved upon completion of the print.

All of the commercialized metal 3D printers involve cutting the metal component off the metal substrate after deposition. A new process for the GMAW 3D printing allows for substrate surface modifications to remove aluminum[51] or steel.[52]

Materials

Traditionally, 3D Printing focused on polymers for printing, due to the ease of manufacturing and handling polymeric materials. However, the method has rapidly evolved to not only print various polymers[53] but also metals[54][55] and ceramics,[56] making 3D printing a versatile option for manufacturing.

Multi-material 3D printing

A drawback of many existing 3D printing technologies is that they only allow one material to be printed at a time, limiting many potential applications which require the integration of different materials in the same object. Multi-material 3D printing solves this problem by allowing objects of complex and heterogeneous arrangements of materials to be manufactured using a single printer. Here, a material must be specified for each voxel (or 3D printing pixel element) inside the final object volume.

A multi-material 3D printed toy.

The process can be fraught with complications, however, due to the isolated and monolithic algorithms. Some commercial devices have sought to solve these issues, such as building a Spec2Fab translator, but the progress is still very limited.[57] Nonetheless, in the medical industry, a concept of 3D printed pills and vaccines has been presented.[58] With this new concept, multiple medications can be combined, which will decrease many risks. With more and more applications of multi-material 3D printing, the costs of daily life and high technology development will become inevitably lower.

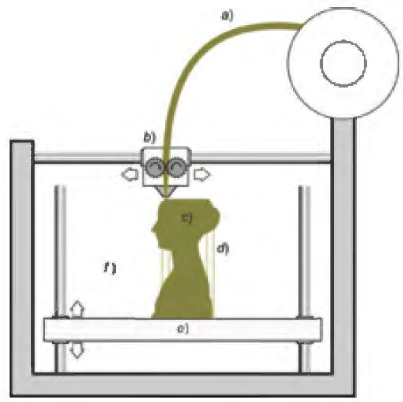
Metallographic materials of 3D printing is also being researched.[59] By classifying each material, CIMP-3D can systematically perform 3D printing with multiple materials.[60]

Processes and printers

There are many different branded 3D printing processes, that can be grouped into seven categories:[61]

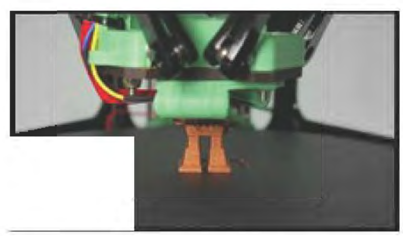
- Vat photopolymerization
- Material jetting
- Binder jetting
- Powder bed fusion
- Material extrusion
- Directed energy deposition
- Sheet lamination

The main differences between processes are in the way layers are deposited to create parts and in the materials that are used. Each method has its own advantages and drawbacks, which is why some companies offer a choice of powder and polymer for the material used to build the object.[62] Others sometimes use standard, off-the-shelf business paper as the build material to produce a durable prototype. The main considerations in choosing a machine are generally speed, costs of the 3D printer, of the printed prototype, choice and cost of the materials, and color capabilities.[63] Printers that work directly with metals are generally expensive. However less expensive printers can be used to make a mold, which is then used to make metal parts.[64]



Schematic representation of the 3D printing technique known as Fused Filament Fabrication; a filament **a)** of plastic material is fed through a heated moving head **b)** that melts and extrudes it depositing it, layer after layer, in the desired shape **c)**. A moving platform **e)** lowers after each layer is deposited. For this kind of technology additional vertical support structures **d)** are needed to sustain overhanging parts

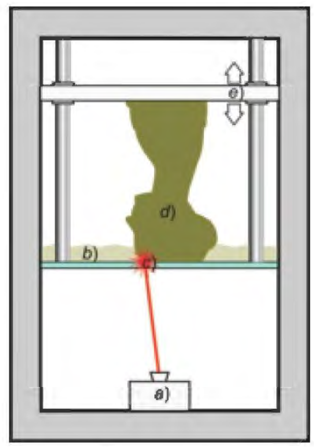
ISO/ASTM52900-15 defines seven categories of Additive Manufacturing (AM) processes within its meaning: binder jetting, directed energy deposition, material extrusion, material jetting, powder bed fusion, sheet lamination, and vat photopolymerization.[65]



A timelapse video of a robot model being printed using FDM

Some methods melt or soften the material to produce the layers. In Fused filament fabrication, also known as Fused deposition modeling (FDM), the model or part is produced by extruding small beads or streams of material which harden immediately to form layers. A filament of thermoplastic, metal wire, or other material is fed into an extrusion nozzle head (3D printer extruder), which heats the material and turns the flow on and off. FDM is somewhat restricted in the variation of shapes that may be fabricated. Another technique fuses parts of the layer and then moves upward in the working area, adding another layer of granules and repeating the process until the piece has built up. This process uses the unfused media to support overhangs and thin walls in the part being produced, which reduces the need for temporary auxiliary supports for the piece.[66] Recently, FFF/FDM has expanded to 3-D print directly from pellets to avoid the conversion to filament. This process is called fused particle fabrication (FPF) (or fused granular fabrication (FGF) and has the potential to use more recycled materials.[67]

Powder Bed Fusion techniques, or PBF, include several processes such as DMLS, SLS, SLM, MJF and EBM. Powder Bed Fusion processes can be used with an array of materials and their flexibility allows for geometrically complex structures,[68] making it a go to choice for many 3D printing projects. These techniques include selective laser sintering, with both metals and polymers, and direct metal laser sintering.[69] Selective laser melting does not use sintering for the fusion of powder granules but will completely melt the powder using a high-energy laser to create fully dense materials in a layer-wise method that has mechanical properties similar to those of conventional manufactured metals. Electron beam melting is a similar type of additive manufacturing technology for metal parts (e.g. titanium alloys). EBM manufactures parts by melting metal powder layer by layer with an electron beam in a high vacuum.[70][71] Another method consists of an inkjet 3D printing system, which creates the model one layer at a time by spreading a layer of powder (plaster, or resins) and printing a binder in the cross-section of the part using an inkjet-like process. With laminated object manufacturing, thin layers are cut to shape and joined together. In addition to the previously mentioned methods, HP has developed the Multi Jet Fusion (MJF) which is a powder base technique, though no laser are involved. An inkjet array applies fusing and detailing agents which are then combined by heating to create a solid layer.[72]



Schematic representation of Stereolithography; a light-emitting device *a)* (laser or DLP) selectively illuminate the transparent bottom *c)* of a tank *b)* filled with a liquid photo-polymerizing resin; the solidified resin *d)* is progressively dragged up by a lifting platform *e)*

Other methods cure liquid materials using different sophisticated technologies, such as stereolithography. Photopolymerization is primarily used in stereolithography to produce a solid part from a liquid. Inkjet printer systems like the *Objet PolyJet* system spray photopolymer materials onto a build tray in ultra-thin layers (between 16 and 30 µm) until the part is completed.[73] Each photopolymer layer is cured with UV light after it is jetted, producing fully cured models that can be handled and used immediately, without post-curing. Ultra-small features can be made with the 3D micro-fabrication technique used in multiphoton photopolymerisation. Due to the nonlinear nature of photo excitation, the gel is cured to a solid only in the places where the laser was focused while the remaining gel is then washed away. Feature sizes of under 100 nm are easily produced, as well as complex structures with moving and interlocked parts.[74] Yet another approach uses a synthetic resin that is solidified using LEDs.[75]

In Mask-image-projection-based stereolithography, a 3D digital model is sliced by a set of horizontal planes. Each slice is converted into a two-dimensional mask image. The mask image is then projected onto a photocurable liquid resin surface and light is projected onto the resin to cure it in the shape of the layer.[76] Continuous liquid interface production begins with a pool of liquid photopolymer resin. Part of the pool bottom is transparent to ultraviolet light (the "window"), which causes the resin to solidify. The object rises slowly enough to allow resin to flow under and maintain contact with the bottom of the object.[77] In powder-fed directed-energy deposition, a high-power laser is used to melt metal powder supplied to the focus of the laser beam. The powder fed directed energy process is similar to Selective Laser Sintering, but the metal powder is applied only where material is being added to the part at that moment.[78][79]

As of December 2017, additive manufacturing systems were on the market that ranged from $99 to $500,000 in price and were employed in industries including aerospace, architecture, automotive, defense, and medical replacements, among many others. For example, General Electric uses high-end 3D Printers to build parts for turbines.[80] Many of these systems are used for rapid prototyping, before mass production methods are employed. Higher education has proven to be a major buyer of desktop and professional 3D printers which industry experts generally view as a positive indicator.[81] Libraries around the world have also become locations to house smaller 3D printers for educational and community access.[82] Several projects and companies are making efforts to develop affordable 3D printers for home desktop use. Much of this work has been driven by and targeted at DIY/Maker/enthusiast/early adopter communities, with additional ties to the academic and hacker communities.[83]

Computed axial lithography is a method for 3D printing based on computerised tomography scans to create prints in photo-curable resin. It was developed by a collaboration between the University of California, Berkeley with Lawrence Livermore National Laboratory.[84][85][86] Unlike other methods of 3D printing it does not build models through depositing layers of material like fused deposition modelling and stereolithography, instead it creates objects using a series of 2D images projected onto a cylinder of resin.[84][86] It is notable for its ability to build an object much more quickly than other methods using resins and the ability to embed objects within the prints.[85]

Liquid additive manufacturing (LAM) is a 3D printing technique which deposits a liquid or high viscose material (e.g. Liquid Silicone Rubber) onto a build surface to create an object which then is vulcanised using heat to harden the object.[87][88][89] The process was originally created by Adrian Bowyer and was then built upon by German RepRap.[87][90][91]

Applications

In the current scenario, 3D printing or Additive Manufacturing has been used in manufacturing, medical, industry and sociocultural sectors which facilitate 3D printing or Additive Manufacturing to become successful commercial technology.[92] More recently, 3D printing has also been used in the humanitarian and development sector to produce a range of medical items, prosthetics, spares and repairs.[93] The earliest application of additive manufacturing was on the toolroom end of the manufacturing spectrum. For example, rapid prototyping was one of the earliest additive variants, and its mission was to reduce the lead time and cost of developing prototypes of new parts and devices, which was earlier only done with subtractive toolroom methods such as CNC milling, turning, and precision grinding.[94] In the 2010s, additive manufacturing entered production to a much greater extent.

The Audi RSQ was made with rapid prototyping industrial KUKA robots.

Additive manufacturing of food is being developed by squeezing out food, layer by layer, into three-dimensional objects. A large variety of foods are appropriate candidates, such as chocolate and candy, and flat foods such as crackers, pasta,[95] and pizza.[96][97] NASA is looking into the technology in order to create 3D printed food to limit food waste and to make food that are designed to fit an astronaut's dietary needs.[98] In 2018, Italian bioengineer Giuseppe Scionti developed a technology allowing to generate fibrous plant-based meat analogues using a custom 3D bioprinter, mimicking meat texture and nutritional values.[99][100]

A 3D selfie in 1:20 scale printed using gypsum-based printing

3D printing has entered the world of clothing, with fashion designers experimenting with 3D-printed bikinis, shoes, and dresses.[101] In commercial production Nike is using 3D printing to prototype and manufacture the 2012 Vapor Laser Talon football shoe for players of American football, and New Balance is 3D manufacturing custom-fit shoes for athletes.[101][102] 3D printing has come to the point where companies are printing consumer grade eyewear with on-demand custom fit and styling (although they cannot print the lenses). On-demand customization of glasses is possible with rapid prototyping.[103]

A 3D printed jet engine model

Vanessa Friedman, fashion director and chief fashion critic at The New York Times, says 3D printing will have a significant value for fashion companies down the road, especially if it transforms into a print-it-yourself tool for shoppers. "There's real sense that this is not going to happen anytime soon," she says, "but it will happen, and it will create dramatic change in how we think both about intellectual property and how things are in the supply chain." She adds: "Certainly some of the fabrications that brands can use will be dramatically changed by technology."[104]

3D printed enamelled pottery

In cars, trucks, and aircraft, Additive Manufacturing is beginning to transform both (1) unibody and fuselage design and production and (2) powertrain design and production. For example:

- In early 2014, Swedish supercar manufacturer Koenigsegg announced the One:1, a supercar that utilizes many components that were 3D printed.[105] Urbee is the name of the first car in the world car mounted using the technology 3D printing (its bodywork and car windows were "printed").[106][107][108]
- In 2014, Local Motors debuted Strati, a functioning vehicle that was entirely 3D Printed using ABS plastic and carbon fiber, except the powertrain.[109] In May 2015 Airbus announced that its new Airbus A350 XWB included over 1000 components manufactured by 3D printing.[110]
- In 2015, a Royal Air Force Eurofighter Typhoon fighter jet flew with printed parts. The United States Air Force has begun to work with 3D printers, and the Israeli Air Force has also purchased a 3D printer to print spare parts.[111]
- In 2017, GE Aviation revealed that it had used design for additive manufacturing to create a helicopter engine with 16 parts instead of 900, with great potential impact on reducing the complexity of supply chains.[112]

AM's impact on firearms involves two dimensions: new manufacturing methods for established companies, and new possibilities for the making of do-it-yourself firearms. In 2012, the US-based group Defense Distributed disclosed plans to design a working plastic 3D printed firearm "that could be downloaded and reproduced by anybody with a 3D printer."[113][114] After Defense Distributed released their plans, questions were raised regarding the effects that 3D printing and widespread consumer-level CNC machining[115][116] may have on gun control effectiveness.[117][118][119][120]

3D printed sculpture of an Egyptian Pharaoh shown at Threeding

Surgical uses of 3D printing-centric therapies have a history beginning in the mid-1990s with anatomical modeling for bony reconstructive surgery planning. Patient-matched implants were a natural extension of this work, leading to truly personalized implants that fit one unique individual.[121] Virtual planning of surgery and guidance using 3D printed, personalized instruments have been applied to many areas of surgery including total joint replacement and craniomaxillofacial reconstruction with great success.[122] One example of this is the bioresorbable trachial splint to treat newborns with tracheobronchomalacia[123] developed at the University of Michigan. The use of additive manufacturing for serialized production of orthopedic implants (metals) is also increasing due to the ability to efficiently create porous surface structures that facilitate osseointegration. The hearing aid and dental industries are expected to be the biggest area of future development using the custom 3D printing technology.[124]

In March 2014, surgeons in Swansea used 3D printed parts to rebuild the face of a motorcyclist who had been seriously injured in a road accident.[125] In May 2018, 3D printing has been used for the kidney transplant to save a three-year-old boy.[126] As of 2012, 3D bio-printing technology has been studied by biotechnology firms and academia for possible use in tissue engineering applications in which organs and body parts are built using inkjet printing techniques. In this process, layers of living cells are deposited onto a gel medium or sugar matrix and slowly built up to form three-dimensional structures including vascular systems.[127] Recently, a heart-on-chip has been created which matches properties of cells.[128]

In 3D printing, computer-simulated microstructures are commonly used to fabricate objects with spatially varying properties. This is achieved by dividing the volume of the desired object into smaller subcells using computer aided simulation tools and then filling these cells with appropriate microstructures during fabrication. Several different candidate structures with similar behaviours are checked against each other and the object is fabricated when an optimal set of structures are found. Advanced topology optimization methods are used to ensure the compatibility of structures in adjacent cells. This flexible approach to 3D fabrication is widely used across various disciplines from biomedical sciences where they are used to create complex bone structures[129] and human tissue[130] to robotics where they are used in the creation of soft robots with movable parts.[131][132]

In 2018, 3D printing technology was used for the first time to create a matrix for cell immobilization in fermentation. Propionic acid production by *Propionibacterium acidipropionici* immobilized on 3D-printed nylon beads was chosen as a model study. It was shown that those 3D-printed beads were capable of promoting high density cell attachment and propionic acid production, which could be adapted to other fermentation bioprocesses.[133]

In 2005, academic journals had begun to report on the possible artistic applications of 3D printing technology.[134] As of 2017, domestic 3D printing was reaching a consumer audience beyond hobbyists and enthusiasts. Off the shelf machines were increasingly capable of producing practical household applications, for example, ornamental objects. Some practical examples include a working clock[135] and gears printed for home woodworking machines among other purposes.[136] Web sites associated with home 3D printing tended to include backscratchers, coat hooks, door knobs, etc.[137]

3D printing, and open source 3D printers in particular, are the latest technology making inroads into the classroom.[138][139][140][141] Some authors have claimed that 3D printers offer an unprecedented "revolution" in STEM education.[142][143] The evidence for such claims comes from both the low-cost ability for rapid prototyping in the classroom by students, but also the fabrication of low-cost high-quality scientific equipment from open hardware designs forming open-source labs.[144] Future applications for 3D printing might include creating open-source scientific equipment.[144][145]

In the last several years 3D printing has been intensively used by in the cultural heritage field for preservation, restoration and dissemination purposes.[146] Many Europeans and North American Museums have purchased 3D printers and actively recreate missing pieces of their relics.[147] The Metropolitan Museum of Art and the British Museum have started using their 3D printers to create museum souvenirs that are available in the museum shops.[148] Other museums, like the National Museum of Military History and Varna Historical Museum, have gone further and sell through the online platform Threeding digital models of their artifacts, created using Artec 3D scanners, in 3D printing friendly file format, which everyone can 3D print at home.[149]

3D printed soft actuators is a growing application of 3D printing technology which has found its place in the 3D printing applications. These soft actuators are being developed to deal with soft structures and organs especially in biomedical sectors and where the interaction between human and robot is inevitable. The majority of the existing soft actuators are fabricated by conventional methods that require manual fabrication of devices, post processing/assembly, and lengthy iterations until maturity of the fabrication is achieved. Instead of the tedious and time-consuming aspects of the current fabrication processes, researchers are exploring an appropriate manufacturing approach for effective fabrication of soft actuators. Thus, 3D printed soft actuators are introduced to revolutionise the design and fabrication of soft actuators with custom geometrical, functional, and control properties in a faster and inexpensive approach. They also enable incorporation of all actuator components into a single structure eliminating the need to use external joints, adhesives, and fasteners. Circuit board manufacturing involves multiple steps which include imaging, drilling, plating, soldermask coating, nomenclature printing and surface finishes. These steps include many chemicals such as harsh solvents and acids. 3D printing circuit boards remove the need for many of these steps while still producing complex designs.[150] Polymer ink is used to create the layers of the build while silver polymer is used for creating the traces and holes used to allow electricity to flow.[151] Current circuit board manufacturing can be a tedious process depending on the design. Specified materials are gathered and sent into inner layer processing where images are printed, developed and etched. The etches cores are typically punched to add lamination tooling. The cores are then prepared for lamination. The stack-up, the buildup of a circuit board, is built and sent into lamination where the layers are bonded. The boards are then measured and drilled. Many steps may differ from this stage however for simple designs, the material goes through a plating process to plate the holes and surface. The outer image is then printed, developed and etched. After the image is defined, the material must get coated with soldermask for later soldering. Nomenclature is then added so components can be identified later. Then the surface finish is added. The boards are routed out of panel form into their singular or array form and then electrically tested. Aside from the paperwork which must be completed which proves the boards meet specifications, the boards are then packed and shipped. The benefits of 3D printing would be that the final outline is defined from the beginning, no imaging, punching or lamination is required and electrical connections are made with the silver polymer which eliminates drilling and plating. The final paperwork would also be greatly reduced due to the lack of materials required to build the circuit board. Complex designs which may takes weeks to complete through normal processing can be 3D printed, greatly reducing manufacturing time.

Legal aspects

Intellectual property

3D printing has existed for decades within certain manufacturing industries where many legal regimes, including patents, industrial design rights, copyrights, and trademarks may apply. However, there is not much jurisprudence to say how these laws will apply if 3D printers become mainstream and individuals or hobbyist communities begin manufacturing items for personal use, for non-profit distribution, or for sale.

Any of the mentioned legal regimes may prohibit the distribution of the designs used in 3D printing, or the distribution or sale of the printed item. To be allowed to do these things, where an active intellectual property was involved, a person would have to contact the owner and ask for a licence, which may come with conditions and a price. However, many patent, design and copyright laws contain a standard limitation or exception for 'private', 'non-commercial' use of inventions, designs or works of art protected under intellectual property (IP). That standard limitation or exception may leave such private, non-commercial uses outside the scope of IP rights.

Patents cover inventions including processes, machines, manufacturing, and compositions of matter and have a finite duration which varies between countries, but generally 20 years from the date of application. Therefore, if a type of wheel is patented, printing, using, or selling such a wheel could be an infringement of the patent.[152]

Copyright covers an expression[153] in a tangible, fixed medium and often lasts for the life of the author plus 70 years thereafter.[154] If someone makes a statue, they may have a copyright mark on the appearance of that statue, so if someone sees that statue, they cannot then distribute designs to print an identical or similar statue.

When a feature has both artistic (copyrightable) and functional (patentable) merits, when the question has appeared in US court, the courts have often held the feature is not copyrightable unless it can be separated from the functional aspects of the item.[154] In other countries the law and the courts may apply a different approach allowing, for example, the design of a useful device to be registered (as a whole) as an industrial design on the understanding that, in case of unauthorized copying, only the non-functional features may be claimed under design law whereas any technical features could only be claimed if covered by a valid patent.

Gun legislation and administration

The US Department of Homeland Security and the Joint Regional Intelligence Center released a memo stating that "significant advances in three-dimensional (3D) printing capabilities, availability of free digital 3D printable files for firearms components, and difficulty regulating file sharing may present public safety risks from unqualified gun seekers who obtain or manufacture 3D printed guns" and that "proposed legislation to ban 3D printing of weapons may deter, but cannot completely prevent, their production. Even if the practice is prohibited by new legislation, online distribution of these 3D printable files will be as difficult to control as any other illegally traded music, movie or software files."[155] Currently, it is not prohibited by law to manufacture firearms for personal use in the United States, as long as the firearm is not produced with the intent to be sold or transferred, and meets a few basic requirements. A license is required to manufacture firearms for sale or distribution. The law prohibits a person from assembling a non–sporting semiautomatic rifle or shotgun from 10 or more imported parts, as well as firearms that cannot be detected by metal detectors or x–ray machines. In addition, the making of an NFA firearm requires a tax payment and advance approval by ATF.[156]

Attempting to restrict the distribution of gun plans via the Internet has been likened to the futility of preventing the widespread distribution of DeCSS, which enabled DVD ripping.[157][158][159][160] After the US government had Defense Distributed take down the plans, they were still widely available via the Pirate Bay and other file sharing sites.[161] Downloads of the plans from the UK, Germany, Spain, and Brazil were heavy.[162][163] Some US legislators have proposed regulations on 3D printers to prevent them from being used for printing guns.[164][165] 3D printing advocates have suggested that such regulations would be futile, could cripple the 3D printing industry, and could infringe on free speech rights, with early pioneer of 3D printing Professor Hod Lipson suggesting that gunpowder could be controlled instead.[166][167][168][169][170][171]

Internationally, where gun controls are generally stricter than in the United States, some commentators have said the impact may be more strongly felt since alternative firearms are not as easily obtainable.[172] Officials in the United Kingdom have noted that producing a 3D printed gun would be illegal under their gun control laws.[173] Europol stated that criminals have access to other sources of weapons but noted that as technology improves, the risks of an effect would increase.[174][175]

Aerospace regulation

In the United States, the FAA has anticipated a desire to use additive manufacturing techniques and has been considering how best to regulate this process.[176] The FAA has jurisdiction over such fabrication because all aircraft parts must be made under FAA production approval or under other FAA regulatory categories.[177] In December 2016, the FAA approved the production of a 3D printed fuel nozzle for the GE LEAP engine.[178] Aviation attorney Jason Dickstein has suggested that additive manufacturing is merely a production method, and should be regulated like any other production method.[179][180] He has suggested that the FAA's focus should be on guidance to explain compliance, rather than on changing the existing rules, and that existing regulations and guidance permit a company "to develop a robust quality system that adequately reflects regulatory needs for quality assurance."[179]

Health and safety

Research on the health and safety concerns of 3D printing is new and in development due to the recent proliferation of 3D printing devices. In 2017 the European Agency for Safety and Health at Work has published a discussion paper on the processes and materials involved in 3D printing, potential implications of this technology for occupational safety and health and avenues for controlling potential hazards.[181]


A video on research done on printer emissions

Hazards

Emissions

Emissions from fused filament printers can include a large number of ultrafine particles and volatile organic compounds (VOCs).[182][183][184] The toxicity from emissions varies by source material due to differences in size, chemical properties, and quantity of emitted particles.[182] Excessive exposure to VOCs can lead to irritation of the eyes, nose, and throat, headache, loss of coordination, and nausea and some of the chemical emissions of fused filament printers have also been linked to asthma.[182][185] Based on animal studies, carbon nanotubes and carbon nanofibers sometimes used in fused filament printing can cause pulmonary effects including inflammation, granulomas, and pulmonary fibrosis when at the nanoparticle size.[186] A National Institute for Occupational Safety and Health (NIOSH) study noted particle emissions from a fused filament peaked a few minutes after printing started and returned to baseline levels 100 minutes after printing ended.[182] Workers may also inadvertently transport materials outside the workplace on their shoes, garments, and body, which may pose hazards for other members of the public.[187]

Carbon nanoparticle emissions and processes using powder metals are highly combustible and raise the risk of dust explosions.[188] At least one case of severe injury was noted from an explosion involved in metal powders used for fused filament printing.[189]

Other

Additional hazards include burns from hot surfaces such as lamps and print head blocks, exposure to laser or ultraviolet radiation, electrical shock, mechanical injury from being struck by moving parts, and noise and ergonomic hazards.[190][191] Other concerns involve gas and material exposures, in particular nanomaterials, material handling, static electricity, moving parts and pressures.[192]

Hazards to health and safety also exist from post-processing activities done to finish parts after they have been printed. These post-processing activities can include chemical baths, sanding, polishing, or vapor exposure to refine surface finish, as well as general subtractive manufacturing techniques such as drilling, milling, or turning to modify the printed geometry.[193] Any technique that removes material from the printed part has the potential to generate particles that can be inhaled or cause eye injury if proper personal protective equipment is not used, such as respirators or safety glasses. Caustic baths are often used to dissolve support material used by some 3D printers that allows them to print more complex shapes. These baths require personal protective equipment to prevent injury to exposed skin.[191]

Since 3-D imaging creates items by fusing materials together, there runs the risk of layer separation in some devices made using 3-D Imaging. For example, in January 2013, the US medical device company, DePuy, recalled their knee and hip replacement systems. The devices were made from layers of metal, and shavings had come loose – potentially harming the patient.[194]

Hazard controls

Hazard controls include using manufacturer-supplied covers and full enclosures, using proper ventilation, keeping workers away from the printer, using respirators, turning off the printer if it jammed, and using lower emission printers and filaments. Personal protective equipment has been found to be the least desirable control method with a recommendation that it only be used to add further protection in combination with approved emissions protection.[182]

3D printers with the manufacturer-provided plastic covers and doors installed, which are examples of engineering controls

Health regulation

Although no occupational exposure limits specific to 3D printer emissions exist, certain source materials used in 3D printing, such as carbon nanofiber and carbon nanotubes, have established occupational exposure limits at the nanoparticle size.[182][195]

As of March 2018, the US Government has set 3D printer emission standards for only a limited number of compounds. Furthermore, the few established standards address factory conditions, not home or other environments in which the printers are likely to be used.[196]

Impact

Additive manufacturing, starting with today's infancy period, requires manufacturing firms to be flexible, ever-improving users of all available technologies to remain competitive. Advocates of additive manufacturing also predict that this arc of technological development will counter globalization, as end users will do much of their own manufacturing rather than engage in trade to buy products from other people and corporations.[12] The real integration of the newer additive technologies into commercial production, however, is more a matter of complementing traditional subtractive methods rather than displacing them entirely.[197]

The futurologist Jeremy Rifkin[198] claimed that 3D printing signals the beginning of a third industrial revolution,[199] succeeding the production line assembly that dominated manufacturing starting in the late 19th century.

Social change

Since the 1950s, a number of writers and social commentators have speculated in some depth about the social and cultural changes that might result from the advent of commercially affordable additive manufacturing technology.[200] In recent years, 3D printing is creating significant impact in the humanitarian and development sector. Its potential to facilitate distributed manufacturing is resulting in supply chain and logistics benefits, by reducing the need for transportation, warehousing and wastage. Furthermore, social and economic development is being advanced through the creation of local production economies.[93]

Street sign in Windhoek, Namibia, advertising 3D printing, July 2018

Others have suggested that as more and more 3D printers start to enter people's homes, the conventional relationship between the home and the workplace might get further eroded.[201] Likewise, it has also been suggested that, as it becomes easier for businesses to transmit designs for new objects around the globe, so the need for high-speed freight services might also become less.[202] Finally, given the ease with which certain objects can now be replicated, it remains to be seen whether changes will be made to current copyright legislation so as to protect intellectual property rights with the new technology widely available.

As 3D printers became more accessible to consumers, online social platforms have developed to support the community.[203] This includes websites that allow users to access information such as how to build a 3D printer, as well as social forums that discuss how to improve 3D print quality and discuss 3D printing news, as well as social media websites that are dedicated to share 3D models.[204][205][206] RepRap is a wiki based website that was created to hold all information on 3d printing, and has developed into a community that aims to bring 3D printing to everyone. Furthermore, there are other sites such as Pinshape, Thingiverse and MyMiniFactory, which were created initially to allow users to post 3D files for anyone to print, allowing for decreased transaction cost of sharing 3D files. These websites have allowed greater social interaction between users, creating communities dedicated to 3D printing.

Some call attention to the conjunction of Commons-based peer production with 3D printing and other low-cost manufacturing techniques.[207][208][209] The self-reinforced fantasy of a system of eternal growth can be overcome with the development of economies of scope, and here, society can play an important role contributing to the raising of the whole productive structure to a higher plateau of more sustainable and customized productivity.[207] Further, it is true that many issues, problems, and threats arise due to the democratization of the means of production, and especially regarding the physical ones.[207] For instance, the recyclability of advanced nanomaterials is still questioned; weapons manufacturing could become easier; not to mention the implications for counterfeiting[210] and on intellectual property.[211] It might be maintained that in contrast to the industrial paradigm whose competitive dynamics were about economies of scale, Commons-based peer production 3D printing could develop economies of scope. While the advantages of scale rest on cheap global transportation, the economies of scope share infrastructure costs (intangible and tangible productive resources), taking advantage of the capabilities of the fabrication tools.[207] And following Neil Gershenfeld[212] in that "some of the least developed parts of the world need some of the most advanced technologies," Commons-based peer production and 3D printing may offer the necessary tools for thinking globally but acting locally in response to certain needs.

Larry Summers wrote about the "devastating consequences" of 3D printing and other technologies (robots, artificial intelligence, etc.) for those who perform routine tasks. In his view, "already there are more American men on disability insurance than doing production work in manufacturing. And the trends are all in the wrong direction, particularly for the less skilled, as the capacity of capital embodying artificial intelligence to replace white-collar as well as blue-collar work will increase rapidly in the years ahead." Summers recommends more vigorous cooperative efforts to address the "myriad devices" (e.g., tax havens, bank secrecy, money laundering, and regulatory arbitrage) enabling the holders of great wealth to "a paying" income and estate taxes, and to make it more difficult to accumulate great fortunes without requiring "great social contributions" in return, including: more vigorous enforcement of anti-monopoly laws, reductions in "excessive" protection for intellectual property, greater encouragement of profit-sharing schemes that may benefit workers and give them a stake in wealth accumulation, strengthening of collective bargaining arrangements, improvements in corporate governance, strengthening of financial regulation to eliminate subsidies to financial activity, easing of land-use restrictions that may cause the real estate of the rich to keep rising in value, better training for young people and retraining for displaced workers, and increased public and private investment in infrastructure development—e.g., in energy production and transportation.[213]

Michael Spence wrote that "Now comes a ... powerful, wave of digital technology that is replacing labor in increasingly complex tasks. This process of labor substitution and disintermediation has been underway for some time in service sectors—think of ATMs, online banking, enterprise resource planning, customer relationship management, mobile payment systems, and much more. This revolution is spreading to the production of goods, where robots and 3D printing are displacing labor." In his view, the vast majority of the cost of digital technologies comes at the start, in the design of hardware (e.g. 3D printers) and, more important, in creating the software that enables machines to carry out various tasks. "Once this is achieved, the marginal cost of the hardware is relatively low (and declines as scale rises), and the marginal cost of replicating the software is essentially zero. With a huge potential global market to amortize the upfront fixed costs of design and testing, the incentives to invest [in digital technologies] are compelling."[214]

Spence believes that, unlike prior digital technologies, which drove firms to deploy underutilized pools of valuable labor around the world, the motivating force in the current wave of digital technologies "is cost reduction via the replacement of labor." For example, as the cost of 3D printing technology declines, it is "easy to imagine" that production may become "extremely" local and customized. Moreover, production may occur in response to actual demand, not anticipated or forecast demand. Spence believes that labor, no matter how inexpensive, will become a less important asset for growth and employment expansion, with labor-intensive, process-oriented manufacturing becoming less effective, and that re-localization will appear in both developed and developing countries. In his view, production will not disappear, but it will be less labor-intensive, and all countries will eventually need to rebuild their growth models around digital technologies and the human capital supporting their deployment and expansion. Spence writes that "the world we are entering is one in which the most powerful global flows will be ideas and digital capital, not goods, services, and traditional capital. Adapting to this will require shifts in mindsets, policies, investments (especially in human capital), and quite possibly models of employment and distribution."[214]

Naomi Wu regards the usage of 3D printing in the Chinese classroom (where rote memorization is standard) to teach design principles and creativity as the most exciting recent development of the technology, and more generally regards 3D printing as being the next desktop publishing revolution.[215]

Environmental change

The growth of additive manufacturing could have a large impact on the environment. As opposed to traditional manufacturing, for instance, in which pieces are cut from larger blocks of material, additive manufacturing creates products layer-by-layer and prints only relevant parts, wasting much less material and thus wasting less energy in producing the raw materials needed.[216] By making only the bare structural necessities of products, additive manufacturing also could make a profound contribution to lightweighting, reducing the energy consumption and greenhouse gas emissions of vehicles and other forms of transportation.[217] A case study on an airplane component made using additive manufacturing, for example, found that the component's use saves 63% of relevant energy and carbon dioxide emissions over the course of the product's lifetime.[218] In addition, previous life-cycle assessment of additive manufacturing has estimated that adopting the technology could further lower carbon dioxide emissions since 3D printing creates localized production, and products would not need to be transported long distances to reach their final destination.[219]

Continuing to adopt additive manufacturing does pose some environmental downsides, however. Despite additive manufacturing reducing waste from the subtractive manufacturing process by up to 90%, the additive manufacturing process creates other forms of waste such as non-recyclable material powders. Additive manufacturing has not yet reached its theoretical material efficiency potential of 97%, but it may get closer as the technology continues to increase productivity.[220]

See also

- 3D modeling
- 3D scanning
- 3D Printing Marketplace
- 3D bioprinting
- 3D Manufacturing Format
- Additive Manufacturing File Format
- Actuator
- AstroPrint
- Cloud manufacturing
- Computer numeric control
- Delta robot
- Fusion3
- Laser cutting
- Limbitless Solutions
- List of 3D printer manufacturers
- List of 3D printing self-publishing
- List of 3D printing services
- List of common 3D test models
- List of emerging technologies
- List of notable 3D printed weapons and parts
- Magnetically assisted slip casting
- MakerBot Industries
- Milling center
- Organ-on-a-chip
- Robocasting
- Self-replicating machine
- Ultimaker
- Volumetric printing

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External links

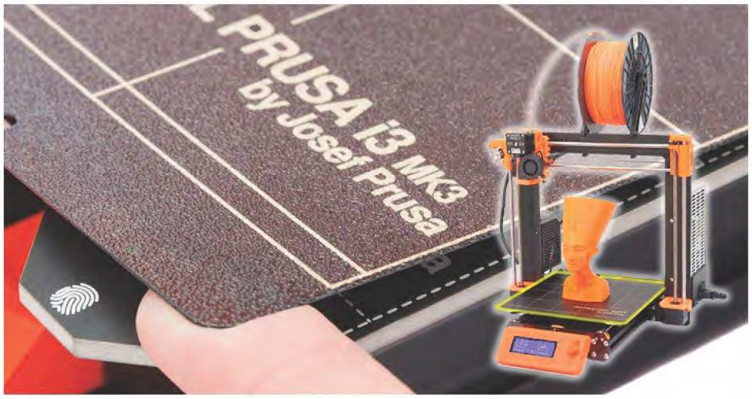
- Rapid prototyping websites (https://curlie.org/Science/Technology/Manufacturing/Prototyping/Rapid_Prototyping) at Curlie

Prusa Introduces New Original Prusa i3 MK3 3D Printer with Lots of New Features

September 25, 2017 • by Sarah Saunders • 3D Printers • 3D Printing

PRUSA RESEARCH by JOSEF PRUSA

In the summer of 2016, the new Original Prusa i3 MK2 Kit was released, with a multi-material upgrade option and calibrate XYZ function announced just a few months later. Now, the open source RepRap 3D printer company, which employs 155 people and makes 6,000 printers a month, has released its latest product – the Original Prusa i3 MK3 3D printer. Prusa, which was just at the New York Maker Faire and is now setting up at the TCT Show in Birmingham, already has the new printer available to pre-order – the kit costs $749, while the fully assembled i3 MK3 printer is $999; the MK2 will stay at the same price of $599.



While the price may seem a little steep, the MK3 has a lot of new features that more than make up for the additional cost, such as an easy to replace powder-coated PEI spring steel print sheet, power panic (ability to fully recover from loss of power), and skipped layers detection.

> "What I am the proudest about is the fact that MK3 is bloody smart," said founder Josef Průša in a blog post. "I repeatedly said that print quality for FDM is peaking, especially with our MK2 holding the top ranks everywhere for over a year, and now we just need to make the technology more digestible for casual users. To do this we added plethora of sensors which can help the printer either guide the user or prevent failed prints."


Laser filament sensor mounted on the extruder

According to Průša, the company wasn't able to do a full upgrade to the MK3, due to the 12v to 24 switch and the printer's new frame; however, it's possible to get to MK2.5 with some additional parts and features, like the tougher, magnetic MK52 Heatbed, filament sensor, new Bondtech extruder that grips the filament from both sides, RPM sensing and Noctua fans, and new P.I.N.D.A 2 upgrade with ambient thermistor.

The MK2 Multi Material from the MK2 and MK2S will be compatible with the MK2.5 and MK3, although the MK3 will have three additional filament sensors that will be sold separately. Speaking of the filament sensors, Prusa uses lasers to detect the presence and movement of filament on the MK3, and it also comes with filament auto loading.


P.I.N.D.A. 2 sensor with additional wire for an embedded thermistor.


Noctua nozzle cooling fan and print cooling fan.

Most single-head printers have a thermistor in the extruder and a second one in the heatbed, but the MK3 comes with a total of four thermistors. One measures the ambient temperature of the electronics, and the other one is embedded into the P.I.N.D.A. 2 probe tip.The MK3 comes with an EINSY RAMBo motherboard, which

shift detection for faster, silent printing. The RAMBo board comes with a special accessory header for connecting Raspberry Pi Zero W, so it's easier than ever to add OctoPrint to your printer.

The MK3 printer also features a brand new Y axis.


New Y axis with aluminium extrusions

> "The most wanted feature was an improved frame rigidity," Průša explained. "We are now introducing the reworked Y axis from aluminium extrusion. It provides the same rigidity as some other printers, while providing the sleek look of our milled Dural frame. The frame is also optimized to add 10mm of Z height totaling at 210mm."

Prusa will be offering a $100 discount for users who recently purchased and received the MK2S and would like to upgrade it to an MK2.5. If you ordered an MK2S but haven't received it yet, Prusa will refund you the price difference, or send you the MK3 instead, with an additional payment.

> "Please don't contact our support about that right now (they really have too much on their plate at this moment), we're going to send an e-mail with vouchers during the next week," Prusa asked users.

Check out the new Original Prusa i3 MK3 printer in action in the video:

Discuss this and other 3D printing topics at 3DPrintBoard.com, or share your thoughts below.

Tagged with: 3d printer filament sensor • 3d printer upgrades • bondtech extruder • cooling fans • Josef Prusa • multi material 3d printing • multi-material 3d printer • New York Maker Faire • OctoPrint • Original Prusa i3 MK3 • pre-order • prusa • Prusa 3D printer • Prusa3D • RAMBo • raspberry pi • TCT Show 2017 • TCT Show Birmingham • TRINAMIC • y-axis

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3DR

3D PRINTERS (HTTPS://3DPRINTINGINDUSTRY.COM/3D-PRINTERS/)

2018 3D PRINTING INDUSTRY AWARDS WINNERS ANNOUNCED

MICHAEL PETCH (HTTPS://3DPRINTINGINDUSTRY.COM/NEWS/AUTHOR/MPETCH/) - MAY 22ND 2018 - 7:31PM 0 0 (HTTPS://3DPRINTINGINDUSTRY.COM/NEWS/2018-3D-PRINTING-INDUSTRY-AWARDS-WINNERS-ANNOUNCED-133578/#RESPOND)

The 2018 3D Printing Industry Awards brought together the leaders of the additive manufacturing world, academic pioneers and many of the major figures in the 3D printing industry.

2018 3D Printing Industry Awards winners announced

Protolabs at the 2018 3D Printing Industry Awards.

Now in its second year, the awards are unique in many ways – including the public voting system used to select the winners. Over 150 guests representing more than 60 companies and institutions gathered at Nuffield Hall next to Regents Park in central London to find out who had won at our gala dinner event.

We were delighted to be joined by guests from the Manufacturing Technology Association (https://www.mta.org.uk/), Innovate UK (https://www.gov.uk/government/organisations/innovate-uk), the U.S. Embassy in London, and many more.

Voting increased by one third on the prior year's awards, making this one of the largest surveys of the 3D printing industry – we'll be publishing this data shortly. Read on to find out who won.

Outstanding contribution to 3D printing

[Fried Vancraen – Founder & CEO Materialise (https://3dprintingindustry.com/news/interview-fried-vancraen-materialise-founder-ceo-110900/)](https://3dprintingindustry.com/news/interview-fried-vancraen-materialise-founder-ceo-110900/)

"From the very start almost 30 years ago, we understood that software is crucial for the development of 3D printing applications. And this remains true today. I call it the ongoing struggle. Looking forward, I believe that software will be the key to unlock new and meaningful applications. We already see it with the trend towards increased automation. At the same time we're laying the groundwork for the future of software in 3D Printing based on Artificial Intelligence."

Fried Vancraen Founder and CEO at Materialise accepts the 2018 3D Printing Industry Award for Outstanding Contribution to 3D Printing.

Innovation of the year

Winner – High Laydown Technology for Material Jetting (https://3dprintingindustry.com/news/basf-xaar-industrialize-photopolymer-jetting-together-124857/), Xaar (http://www.xaar.com/en/)

Neil Hopkinson, Director of 3D Printing, Xaar, "As 3D Printing develops to take its place as a mainstream manufacturing process it is clear that certain challenges need to be overcome and we are very proud that Xaar's High Laydown Technology addresses two of the main challenges – namely the speed of part manufacture and the properties of parts produced. To win the award for Innovation of the year is especially pleasing as this normally goes to a specific 3D Printing process, whereas in this case it goes to an enabling platform from which multiple, highly differentiated, processes can be created; the fact that this subtlety was appreciated by the 3D Printing Industry readership speaks volumes for the insight and credibility of this community."

Angus Condie, Director of Integration and Applications, Xaar accepts the 2018 3D Printing Industry Award for Innovation of the Year.

Innovation of the year – shortlisted nominees

High Laydown Technology for Material Jetting, Xaar (http://www.xaar.com/)Large-scale, optically transparent glass at architectural scale, MIT Mediated Matter Group
HP Full Color Jet Fusion 500/300 Series
Next Gen AM – EOS, Daimler, Premium Aerotec
BlackBelt 3D BV
Materialise E-stage for metal
Mimaki 3DUJ-553
XStrand fiberglass 3D printer filaments, Owens Corning
Pricing & bureau matching algorithm, Xometry
Markforged Metal X

Aerospace or Automotive application

Winner: Volkswagen Autoeuropa, Ultimaker (https://3dprintingindustry.com/news/volkswagen-saves-160k-tooling-costs-using-desktop-fdm-3d-printers-116640/)

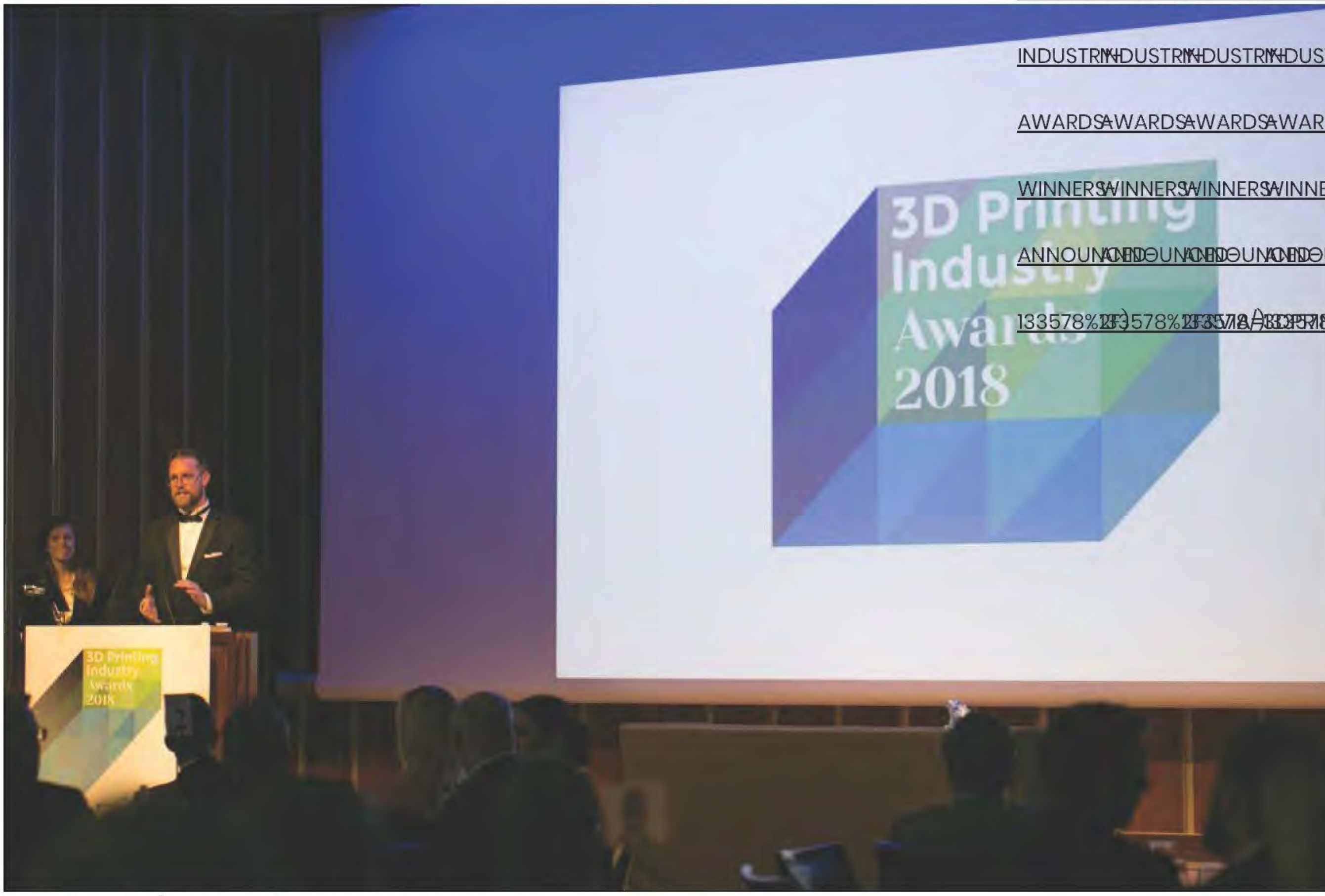
Siert Wijnia, CTO and Co-founder at Ultimaker, "I am very proud that Ultimaker and Volkswagen Europa have won the 'Automotive Application of the Year' in the 2018 3D Printing Industry Awards. The tools, jigs and fixtures created by the team of Volkswagen Autoeuropa with our 3D printers, managed to save the production plant approximately €325,000 in 2017. By making 3D printing accessible, reliable and hassle-free we aim to accelerate the world's transition to local digital manufacturing. By 3D printing their own smart manufacturing aids on multiple 3D printers in their facilities, this is exactly what Volkswagen Autoeuropa did."

Siert Wijnia, CTO and Co-Founder at Ultimaker collecting the 2018 3D Printing Industry Award.

Aerospace or Automotive application – shortlisted nominees

Titanium propellant tanks, Lockheed Martin Space Systems, Sciaky EBAM
MINI Yours, BMW
Emirates 3D Printed Interior Cabin Parts, 3D Systems
Fortus 900mc Aircraft Interiors Certification Solution, Stratasys
Volkswagen Autoeuropa, Ultimaker (https://ultimaker.com/)
Mercedes-Benz, digital spare parts
Boeing 787 Dreamliner titanium components, Norsk Titanium

Bugatti Chiron Brake Caliper
Airbus A350 XWB pylon with bracket, Arconic
SAIC Yanfeng, 3D Printed Gauge Control Units, INTAMSYS



Academic/research team of the year

Winner – Centre for Additive Manufacturing (CfAM) at Nottingham University (https://3dprintingindustry.com/news/cfam-publishes-breakthrough-multifunctional-method-electronics-124438/)

Richard Hague, Professor of Innovative Manufacturing, Director, Centre for Additive Manufacturing (CfAM), "We are absolutely delighted to be awarded the award for Research Group of the year award for 2018. This award is testament to the hard work that has been put in by the whole team of over 100 people over the past several years – the CfAM is also in a fantastic place to build on its position over the next several years having recently moved into a brand new, state of the art facility and been awarded several large EPSRC grants to continue our work on pushing the boundaries of Additive Manufacturing."

The award was presented by Mahvash Siddiqui, Science, Tech and Health officer of the U.S. Embassy in London.

[L-R] Beau Jackson, Mahvash Siddiqui, Phill Dickens and Michael Petch.

Academic/research team of the year – shortlisted nominees

Oerlikon's Additive Manufacturing Technology & Innovation Center in Munich
Hod Lipson, Creative Machines Lab at Columbia University
Pearce Research Group at Michigan Tech University
3D Printing Medical Research Center (3DP MRC) at China Medical University (CMU) in Taiwan
Shah Tissue Engineering and Additive Manufacturing Lab at Northwestern University
Engineering, Design and Computing (EDAC) group at ETH Zurich
The TwoCure team at Fraunhofer ILT & Rapid Shape GmbH
Centre for Additive Manufacturing (CfAM) at Nottingham University (https://www.nottingham.ac.uk/research/groups/Cfam/)SIMTech/A*STAR Nanyang Technological University, Singapore
WAAM Lab at Cranfield University

3D Scanning Application of the year

Winner – Yuniku eyewear, HOYA & Materialise (https://3dprintingindustry.com/news/trends-additive-manufacturing-end-use-production-materialise-2-124909/).

Fried Vancraen, Materialise founder and CEO, "We are honored to have been recognized with these awards which to us, are a confirmation of our continuing efforts to be the driving force behind the transformational power of Additive Manufacturing. From the very start almost 30 years ago, we understood that software is crucial for the development of 3D printing applications. And this remains true today. Looking forward, I believe that software will be key to unlocking new and meaningful applications, such as today with Yuniku. At the same time we're laying the groundwork for the future of software in 3D Printing based on Artificial Intelligence."

Koen Neutjens, Product Manager at Materialise collecting the 2018 3D Printing Industry award for 3D scanning application of the year.

3D Scanning Application of the year – shortlisted nominees

Our Lady of Cao, FARO Design ScanArm
Yuniku eyewear, HOYA & Materialise (http://www.materialise.com/en/cases/transforming-eyewear-and-eyewear-industry-yuniku)Deutsche Bahn Digitalisation of Spareparts
Dutch Royal Navy, and Belgian Navy, Artec
Zhou Zhongfei 3D Printing Art Studio & Shining 3D EinScan-Pro
Civilisations AR App, BBC Research and Development team
3D Visualisation Lab at Natural History Museum (blue whale), Faro & Creaform

SMK Open Project, Scan the World structured light scans
Balenciaga Demna Gvasalia FW18 Collection
Facial Reconstruction of unidentified deceased Migrants, Joe Mullins/New York Academy of Art

Creative use of 3D printing

Winner – Black Panther Brisk Promotion, PepsiCo & Protolabs (https://www.protolabs.com/)

Daniel Cohn, General Manager, Protolabs Germany, 3D Printing, "We are very honoured to receive such an award, following the extremely interesting project we have worked on. The remarkable designs that we help to manufacture, are a credit to where industry is going, and we are very happy to be a part of that. The awards were a great celebration of 3D printing as a whole."

Daniel Cohn, General Manager, Protolabs Germany, 3D Printing, collecting the 2018 Creative Use of 3D Printing Industry Award.

Creative use of 3D printing – shortlisted nominees

Bottletop flagship store, AI Build, KRAUSE Architects, Reflow & KUKA
Scenography for Teatro dell'Opera di Roma, WASP
Royal College of Art/Beijing Opera Project, Mingjing Lin, Tsai-Chun Huang & Sinterlt
Y-3 Futurecraft 4D, Yohji Yamamoto, adidas & Carbon

Black Panther Brisk Promotion, PepsiCo & Protolabs (https://protolabs.com)
Stranger Things Demogorgon, Formlabs & Aaron Sims Creative
ESSO Upcycling Challenge, DDB Worldwide
Massivit 3D – Signage
Valve gamer-created merchandise, Shapeways
NASA 3D Printed Habitat Challenge

Community advocate of the year

Winner – Nora Toure, Women in 3D Printing (https://3dprintingindustry.com/news/3d-printing-next-five-years-nora-toure-business-development-director-sculpteo-founder-women-3d-printing-109898/)

"Thank you all for the votes and the recognition. I am personally honored to receive this award. I am sharing it with our entire community of women who are advancing our industry, wherever they are, whatever industry they are coming from. Women in 3D Printing is the community it is today thanks to them and their hard work. This award goes to all the women working in Additive Manufacturing," Nora Toure, Founder Women in 3D Printing.

Kadine James, 3D Tech Lead, Hobs 3D, collected the award on Nora Toure's behalf, "Nora is a true inspiration to me and to many women from all over the world. The Women In 3D Printing network celebrates inspirational and talented women doing exceptional work in additive manufacturing. Nora is a true pioneer and a light force to our industry and in particular to the next generation of future female founders and tech leaders."

Kadine James, 3D Tech Lead, Hobs 3D at the 2018 3D Printing Industry Awards.

Community advocate of the year – shortlisted nominees

Ralph Resnick, America Makes
Thomas Sanladerer, Tom's 3D
Naomi Wu, Sexy Cyborg
Angus Deveson, Maker's Muse
Lauralyn McDaniel, SME MMI
Joel Telling, 3D Printing Nerd
Devin Montes, Make Anything
Joe, 3D Maker Noob
Jan Cottons, ...
Nora Toure, Women in 3D Printing (https://womenin3dprinting.com/)

Material company of the year

Winner – BASF (https://3dprintingindustry.com/news/new-3d-printing-materials-from-basf-and-essentium-materials-132345/)

Dr Darren Budd, Commercial Director UK & Ireland, BASF plc collecting the award for Material Company of the Year.

Material company of the year – shortlisted nominees

Rigid Ink
Filamentive
Hexcel/Oxford Performance Materials
ColorFabb
PyroGenesis Canada Inc.
BASF (http://www.basf.com/)Polymaker
Heraeus metal powders
LPW Technology
DSM Somos

OEM of the year (enterprise)

Winner – GE Additive (https://3dprintingindustry.com/news/interview-inside-ge-additive-spectra-h-annika-olme-arcam-132932/)

Jason Oliver, President & CEO, GE Additive, "On behalf of everyone at GE Additive, we're delighted to win the 3Dprintingindustry.com award for OEM of the year (metal). Since day 1, our mission at GE Additive has been to accelerate the adoption rate of additive across the world. It's great to see the industry grow and everyone grow with it. Special thanks to the 1200 GE Additive employees who make this all possible."

Neil Siddons, Communications Leader, GE Additive collects the 2018 3D Printing Industry Award for OEM of the year.

OEM of the year (enterprise) – shortlisted nominees

Voxeljet
XYZ Printing
Trumpf
EOS
Sisma
GE Additive (https://www.ge.com/additive/)
EnvisionTEC
Shining 3D

Farsoon Technologies
Renishaw

Investor or Professional Services of the year

Winner – AM Ventures Holding GmbH (https://3dprintingindustry.com/news/additive-manufacturing-investment-ventures-accelerate-exmets-commercialization-amorphous-metals-109229/)

Arno Held, Chief Venture Officer, AM Ventures Holding GmbH, "The entire team of AM Ventures is feeling honored and proud to be awarded Investor of the Year 2018 by the readers of 3D Printing Industry. This award means particularly much to us, as it gives credit to our philosophy of sustainable investments and trust in people by the community of one of the globally leading media in our industry."

Arno Held, Chief Venture Officer, AM Ventures Holding GmbH

Investor or Professional Services of the year – shortlisted nominees

Inside

STANLEY+Techstars Accelerator
AM Ventures

(http://www.amv.ventures/)Siemens
Balderton Capital
Lux Capital
Paul Hastings LLP
Baillie Gifford
Kima Ventures
PWC

3D Software of the year

Winner – Autodesk Netfabb (https://3dprintingindustry.com/news/autodesk-integrates-project-dreamcatcher-netfabb-2018-generative-design-117224/)

Dean Franks, Autodesk Head of Global Sales – Additive Manufacturing, "We're delighted and honoured to be awarded 3D Software of the Year by readers of 3D Printing Industry and our customers. Autodesk developed Netfabb to make it easier for our customers to streamline their end to end additive workflow, from Generative Design of a 3D model through Simulation and Optimisation to a final part. We're grateful for this acknowledgement and appreciate that our customers are finding such value from our total additive manufacturing solutions."

Dean Franks, Autodesk Head of Global Sales: Additive Manufacturing collects the 2018 3D Printing Industry Award for 3D Software of the Year.

3D Software of the year – shortlisted nominees

Vectary
Simplify 3D
3D Systems 3DXpert
Cura
ANSYS Additive Print
Autodesk Netfabb (https://www.autodesk.co.uk/products/netfabb/overview)SolidWorks
OnShape
nTopology Element
Sony 3D Creator

Medical, dental or healthcare application

Winner – Figure 4 and NextDent, 3D Systems (https://3dprintingindustry.com/news/3d-systems-nextdent-5100-3d-printer-dental-materials-129455/)

"We are delighted that 3D Systems' NextDent 5100 has been selected as the 2018 3D Printing Industry Award winner for Healthcare Application of the Year," said Rik Jacobs, vice president, general manager of dental solutions, 3D Systems. "Powered by our Figure 4™ 3D printing technology, the NextDent 5100 solution enables dental laboratories and clinics to produce dental devices at speeds up to 4x faster than other solutions, while reducing material waste and capital equipment expenditure as well as reliance upon milling centers. This recognition from the industry supports what the dental community is telling us – that the NextDent 5100 solution is redefining digital dentistry and enhancing patient care."

Rik Jacobs, vice president, general manager of dental solutions, 3D Systems.

Medical, dental or healthcare application – shortlisted nominees

K2M CASCADIA AN 3D Interbody System
Figure 4 and NextDent, 3D Systems (https://uk.3dsystems.com/)EnvisionTEC E-IDB for indirect bonding trays, for placement of orthodontic brackets
Luxexcel VisionPlatform for ophthalmic lenses
E-Nable Low-Cost 3D Printed Prosthetics
Anatomics Sternum Ribcage Composite Implant
3D printed heart models at Phoenix Children's Hospital
3D printed ribs at Morriston Hospital Wales, Renishaw
Johnson & Johnson's Tissue Regeneration System Bone Grafts
Ambionics, Stratasys & Autodesk

Enterprise 3D printer of the year (polymers)

Winner – Markforged Mark 2 (https://3dprintingindustry.com/news/mark-two-carbon-fiber-3d-printer-unveiled-by-mark-forged-65831/)

"We love this award (we display it in our lobby). The only thing better than winning it once is winning it again!", Greg Mark, CEO, Markforged.

Enterprise 3D printer of the year (polymers) – shortlisted nominees

3D Systems ProX 800
EOS P500
3DGence INDUSTRY F340
INTAMSYS FUNMAT HT
Stratasys F123D Series
Prodways ProMaker LD-10
Asiga Max UV
HP Jet Fusion 3D 4210 Printing Solution
Markforged Mark 2 (https://markforged.com/)Nano Dimension DragonFly 2020 Pro 3D Printer

OEM of the year (personal)

Winner – E3D Online (https://3dprintingindustry.com/news/e3d-online-launches-water-cooling-enhanced-fff-3d-printer-performance-126397/)

2018 3D Printing Industry Awards winners announced
Sanjay Mortimer and Joshua Rowley from E3D at the 2018 3D Printing Industry Awards.

OEM of the year (personal) – shortlisted nominees

MatterHackers
E3D Online (https://e3d-online.com/)Duet3D
BCN3D
Formlabs
Ultimaker
Cubicon
MakerBot
M3D
Airwolf 3D

Enterprise 3D printer of the year (Metal)

Winner – Desktop Metal Studio System (https://3dprintingindustry.com/news/desktop-metal-3d-printers-pricing-technical-specifications-announced-111531/)

"We are honored to be the recipient of the Enterprise Metal 3D Printer of the Year award," said Ric Fulop, co-founder and CEO. "It's truly rewarding to receive such expert and industry validation for our Studio System, the world's first office-friendly metal 3D printing technology. Our team is proud to have the support of the additive manufacturing industry as we work to change the way products will be designed and manufactured."

Bjoern Klaas, Vice president and Managing director for Protolabs Europe [center].

The Enterprise 3D printer of the year (Metal) award was presented by Bjoern Klaas, Vice president and Managing director for Protolabs Europe.

Enterprise 3D printer of the year (Metal) – shortlisted nominees

EOS M290
SLM Solutions SLM 500
3D Systems ProX DMP 320
Desktop Metal Studio System (https://www.desktopmetal.com/)Concept Laser M2 Cusing
Exone M-flex
ORLAS CREATOR
XJet Carmel 1400
Markforged Metal X
Xact Metal XM200

Start up of the year

Winner – Additive Manufacturing Technologies (AMT) Ltd. (https://3dprintingindustry.com/news/farsoon-offer-automated-post-processing-collaboration-amt-129848/)

Joseph Crabtree, CEO, Additive Manufacturing Technologies Ltd., “AMT are delighted to have been selected as Startup of the year in the 2018 3D Printing Industry Awards in recognition of our innovative automated post processing technology solutions. We would like to thank all the people that have voted for us from across the industry and we look forward to sharing our exciting future growth and new product release plans with you shortly.”

Start up of the year – shortlisted nominees

AstroPrint
3YOURMIND
Pollen AM
Additive Manufacturing Technologies (AMT) Ltd (https://amtechnologies.co.uk/)XtreeE
Glaze Prosthetics
AON3D
DyeMansion
Frustum Inc.
Wiivv

Additive Manufacturing Technologies CEO Joseph Crabtree at the 2018 3D Printing Industry Awards.

Personal 3D printer of the year (other)

Winner – [Formlabs Form 2 (https://3dprintingindustry.com/news/top-10-sub-5000-photopolymer-3d-printers-53349/)](https://3dprintingindustry.com/news/top-10-sub-5000-photopolymer-3d-printers-53349/)

Michael Sorkin, managing director of Formlabs Europe, "Formlabs is thrilled readers and users continue to choose the Form 2 as their preferred desktop 3D printer. We couldn't have become the number one selling SLA printer without our fantastic community of users, partners and supporters. Thank you!"

Jimmy Littman, Formlabs Country Manager for UK & Ireland collected the 2018 3D Printing Industry Award for the Form 2.

Personal 3D printer of the year (other) – shortlisted nominees

Peopoly Moai
Sinterit Lisa
B9 Creations Core Series
[Formlabs Form 2 (https://formlabs.com/)](https://formlabs.com/)Cubicon Lux Full HD (210DS)
Anmao D7
Photocentric Liquid Crystal Precision

T3D Mobile 3D printer
Sintratec Kit
Miicraft+

Personal 3D printer of the year (FFF)

Winner – Original Prusa i3 MK3 (https://3dprintingindustry.com/news/prusa-releases-smartest-3d-printer-yet-original-i3-mk3-tech-specs-pricing-121732/)

The award was presented by Dr. Adrian Bowyer, founder of the RepRap project.

[L-R] Josef Prusa, Michael Petch and Dr. Adrian Bowyer.

Original Prusa i3 MK3 (https://www.prusa3d.com/)Robo 3D R2
Creality CR-10
Snapmaker
BCN3D Sigmax

Lulzbot TAZ-6
Zortrax M200
Delta WASP TURBO 2
Raise N2
Flashforge Finder

Josef Prusa, founder and CEO of Prusa Research.

3D Printing Region of the year

Winner – London, UK

3D Printing Region of the year – shortlisted nominees

Kraków, Poland
San Diego, CA
Barcelona, Spain
Boston, MA
London, UK
Mich
Shenzhen, China

Singapore
Seoul, South Korea
The Netherlands

Best 3D printing company to work for

Winner – EOS (https://3dprintingindustry.com/news/trends-additive-manufacturing-end-use-production-eos-124824/)

“We’re delighted to have been chosen as the best 3D printing company to work for in 2018 by 3D Printing Industry’s readers,” said Juliane Finke, Senior Vice President Human Resources, EOS. “It is a testament to the importance EOS puts on attracting and retaining the best talent. EOS can only stay at the forefront of 3D printing if our employees are passionate about what they do, and empowered to constantly innovate and think the impossible.”

Best 3D printing company to work for – shortlisted nominees

Prusa Research
Materialise
HP
EOS (https://www.eos.info/en)Markforged
XJet
Align Technology
3D Systems
Glaze Prosthetics
DyeMansion

The 2019 3D Printing Industry Awards will take place on June 6th 2019. Contact us for early-bird ticket prices (https://3dprintingindustry.com/contact-us/).

We will begin accepting nominations for the 2019 Awards in December. Make sure you subscribe to our newsletter (https://3dprintingindustry.com/newsletter/) to be the first with all the details. You can also follow us on Twitter (https://twitter.com/3dprintindustry), and like us on Facebook (https://facebook.com/3dprintingindustry).

Search and post 3D Printing Jobs (https://jobs.3dprintingindustry.com/) for opportunities and new talent across engineering, marketing, sales and more.

Featured image shows Fried Vancraen, Materialise founder and CEO at the 2018 3D Printing Industry Awards. Photo by Michael Petch.

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Michael Petch is the editor-in-chief at 3DPI and the author of several books on 3D printing. He is a regular keynote speaker at technology conferences where he has delivered presentations such as 3D printing with graphene and ceramics and the use of technology to enhance food security. Michael is most interested in the science behind emerging technology and the accompanying economic and social implications.

(https://twitter.com/MichaelIPetch) (mailto:michael@3dprintingindustry.com)

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Matias Santini

The fact that M3D is shortlisted for anything other than worst 3D print company in the world is a head shaker.

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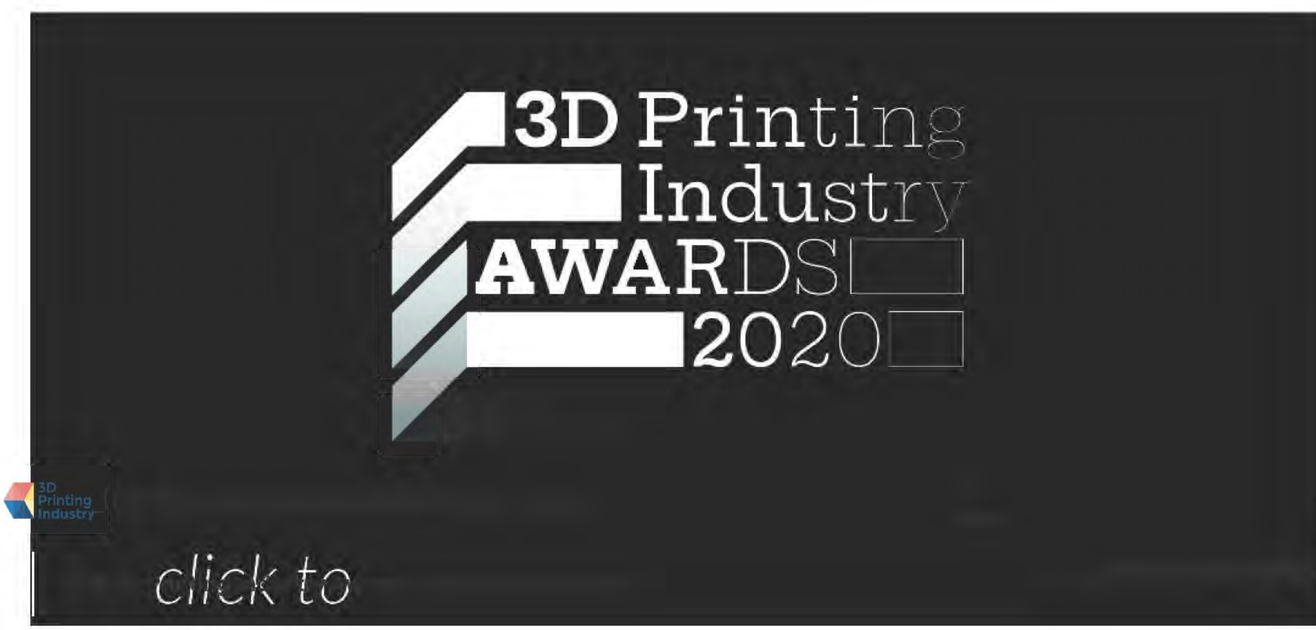

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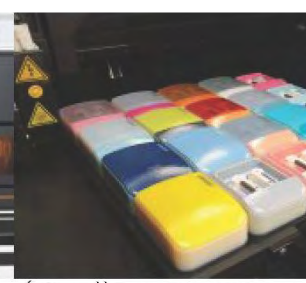

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Last week, the winners of the 2019 3D Printing Industry Awards (https://3dprintingindustry.com/?s=3d+printing+industry+awards) were selected by our readers. Representing the best hardware of the year, most innovative applications, and many well respected names in the 3D printing industry, this year's annual event saw the attendance of more than 150 guests, representing over 60 companies in both desktop and industrial additive manufacturing – 32% more than last year.

To our third-annual event, located in Nuffield Hall in central London, we were pleased to welcome key guests from Protolabs (https://www.protolabs.co.uk/), AM Ventures (http://www.amventures.com/), RPS (https://rps.ltd/), Voxeljet (https://www.voxeljet.com/) and more, including, for the first time, a royal family member, His Highness Azzan Kais Tarik Al-Said of Oman.

In what is one of the largest surveys of the 3D printing industry, over 80,000 votes were collected this year. Read on to find out who you voted for, and for exclusive comment from this year's winners of the 2019 3D Printing Industry Awards.

Thank you to all of those who voted, and to every nominee and winner for 2019. We look forward to next year!

The 3D Printing Industry team onstage with all winners of the 2019 3D Printing Industry Award. Photo by Vickie Licková for 3D Printing Industry

Community Advocate – Shortlist

Peanut3D
Thomas Sanladerer, Toms3D
3D Maker Noob
Phil Hall, The Windsor Boys' School
Devin Montes, Make Anything
Dr. Michael Scherer, Prosthodontist at Sonora Modern Dentistry & Orthodontics
Dr. Joshua Pearce (https://3dprintingindustry.com/news/3d-printing-next-five-years-prof-joshua-pearce-108554/), Michigan Technological University (MTU)
The American Society of Mechanical Engineers (ASME)
Ralph Resnick, America Makes
Avi Reichental

Community Advocate of the Year: Lauralyn McDaniel, Industry Events Manager, ASME.

"To be honored as the community advocate of the year for doing what has become my purpose in life—to impact people's lives with 3D printing—is something I will carry with me for those moments when the challenges seem insurmountable," said McDaniel in acceptance of the award.

> "I'M GRATEFUL TO EVERYONE IN THE MEDICAL AM/3DP AND STANDARDS COMMUNITIES FOR ALLOWING ME TO BE A PART OF THEIR EFFORTS."

Lauralyn McDaniel, Industry Events Manager, ASME, accepts the 2019 Community Advocate of the Year Award. Photo by Felix Li for 3D Printing Industry

Aerospace or Automotive Application – Shortlist

The European Space Agency (ESA) and BEEVERYCREATIVE's Project MELT microgravity 3D printer
BMW 3D printed cylinder head for the S58 engine
Airbus Helicopters EOS M400-1 3D printed A350 latches
Launcher and EOS, copper alloy E-1 rocket engine
DMG MORI & Porsche

Energica Motorcycles and CRP, 3D printed end use motor terminal cover
Sciaky, EBAM project with Lockheed Martin to make satellite fuel tanks (https://3dprintingindustry.com/news/lockheed-martin-produces-its-largest-3d-printed-parts-for-space-136207/)
Cranfield University and WAAM3D 2.5m x 1.5 m rearframe for the BAE Systems Eurofighter Typhoon (https://3dprintingindustry.com/news/cranfield-unveils-highest-profile-waam-parts-to-date-for-bae-systems-and-thales-alenia-space-150215/)
ParaMatters and Renishaw, ECOSSE Moto Works Nightstalker motorcycle bracket design
Thales Alenia Space series production of satellites for Eutelsat Communications

Aerospace or Automotive Application of the Year: Cranfield University and WAAM3D's 2.5m x 1.5 m rearframe for the BAE Systems Eurofighter Typhoon

Dr. Filomeno Martina, Senior lecturer in Additive Manufacturing, at the Welding Engineering & Laser Processing Centre, Cranfield University, comments, "We have been developing WAAM since 2006 and we have worked hard to raise the profile of the technology, demonstrating the enormous impact it will have on manufacturing businesses around the world,"

> "WINNING SUCH AN IMPORTANT AWARD FOR SUCH A CRITICAL AEROSPACE COMPONENT RECOGNIZES HOW AM IS MUCH MORE THAN POWDER-BED ONLY, AND GIVES US EVEN MORE MOTIVATION TO BRING LARGE-SCALE METAL AM TO ALL OF YOU,"

"The team has been focusing on commercialization for a while, and 2019/2020 will see large-scale metal AM become affordable and doable by everyone."

Dr. Filomeno Martina, Cranfield University, accepts the award on part of his university and WAAM3D for the 2019 Aerospace or Automotive Application of the Year Award. This year, the trophy was awarded for the collaborators' work to 3D print a 2.5m x 1.5 m rearframe for the BAE Systems Eurofighter Typhoon. Photo by by Vickie Licková for 3D Printing Industry

Innovation – Shortlist

Digital Metal, high-precision 3D metal printing (https://3dprintingindustry.com/news/digital-metal-announces-automation-to-advance-serial-metal-additive-production-141477/)
University of Michigan, rapid continuous additive manufacturing
University of Freiburg spinoff Glassomer, 3D printed silica glass
XJet Nano Particle Jetting (NPJ)
EOS LaserProFusion (https://3dprintingindustry.com/news/eos-to-premier-million-laser-polymer-3d-printing-at-formnext-2018-142852/)
BigRep MXT Extrusion Technology
Farsoon Technologies, Flight Technology for polymer laser sintering
Digital Alloys' Joule Printing
Betatype, serial production of LED headlamp heatsink for cars
Mimaki 3DUJ-553 UV LED printing solution

Innovation of the Year, presented by Daniel Cohn, Managing Director, Protolabs: Digital Metal, high-precision 3D metal printing.

Alexander Sakratidis, Sales & Marketing Manager at Digital Metal AB, commented, "We are honored to have received the award Innovation of the Year and truly glad that our efforts have been recognized by the industry."

"WE PROMISE TO CONTINUE TO INNOVATE, DEVELOP AND IMPROVE OUR DIGITAL METAL TECHNOLOGY TO MAKE IT EVEN BETTER. THANK YOU ALL."

Alexander Sakratidis, Sales & Marketing Manager, Digital Metal AB, accepts the award for 2019 Innovation of the Year. This year, the trophy was awarded for Digital Metal's precision 3D metal printing technology. Photo by Felix Li for 3D Printing Industry

Value-added reseller – Shortlist

Matterhackers
GoPrint 3D
Creat3D
Tri-Tech
Europac 3D
Laser Lines
3DGBIRE

Multistation
Dynamism
SYS Systems/Carfulan Group

Value-added reseller of the year: 3DGBIRE

"3DGBIRE was set up to provide the support needed to drive the adoption of 3D printing," comments Paul Croft, Director 3DGBIRE, UltimakerGB & Founder of Create Education.

> "WE'RE DELIGHTED TO ACCEPT THIS AWARD AS VALIDATION OF THE VALUE THE TEAM TRY TO ADD EVERYDAY AND WOULD LIKE TO THANK EVERYONE WHO TOOK THE TIME TO VOTE. EXCITING TIMES AHEAD!"

Leah Melling, Marketing Manager 3DGBIRE, accepts her company's award for 2019 Value Added Reseller of the Year. Photo by Felix Li for 3D Printing Industry

Outstanding contribution to 3D printing

As previously announced Dr. Hans Langer, founder and CEO of EOS, was awarded the lifetime achievement Outstanding Contribution to 3D Printing award in 2019. See our interview with Dr. Langer (https://3dprintingindustry.com/news/interview-dr-hans-langer-founder-of-eos-to-receive-2019-outstanding-contribution-to-3d-printing-award-155212/) here for further insight into his direction of the company, and note prior winners Dr. Adrian Bowyer (https://3dprintingindustry.com/news/interview-dr-adrian-bowyer-10th-anniversary-reprap-133841/), and Fried Vancraen (https://3dprintingindustry.com/news/interview-fried-vancraen-materialise-founder-ceo-110900/) here.

In acceptance of this award, Dr. Langer commented, "Thank you very much for this award. It's a very big honor for me. And you can imagine that we appreciate this in the year of 30 years of EOS, but I can tell you, we have gone a long way. But this is by far not the end."

> "I'M VERY PROUD THAT THAT I HAVE SUCH A CAPABLE TEAM AROUND ME TO REALLY BREAK THIS FRANCHISE IN TERMS OF DIGITAL MANUFACTURING."

Markus Glasser, Senior Vice President Export, EOS, accepts the 2019 Outstanding Contribution to 3D Printing award on behalf of Dr. Hans Langer, Founder and CEO of EOS. Photo by Vickie Licková for 3D Printing Industry

Desktop FFF 3D printer – Shortlist

Ultimaker S5
Creality CR-10
MakerBot Method (https://3dprintingindustry.com/news/hq-visit-makerbot-launches-method-performance-3d-printer-145316/)
BCN3D Technologies' Sigmax R19
Raise3D Pro2
Zortrax M200
Zmorph VX (https://3dprintingindustry.com/news/review-zmorph-vx-a-strong-3d-printer-with-multi-tool-capabilities-145113/)
3DGence Double P255
Sindoh 3DWOX 1
Biqu Magician

Desktop FFF 3D printer of the year: a wildcard entry, the Prusa i3 MK3

"I am extremely excited about our second win in this category and it was quite a pleasant surprise," commented Josef Průša, CEO & Founder, Prusa Research. "We are very proud of all the love MK3 is getting from all of its users,

> "WE CANNOT WAIT FOR THE NEXT YEAR'S ROUND, WHERE ORIGINAL PRUSA SL1, PRUSAMENT AND PRUSASLICER WILL BE FIGHTING IN THREE NEW CATEGORIES! THANK YOU EVERYONE FOR YOUR SUPPORT THIS GIVES US ENORMOUS AMOUNT OF ENERGY FOR THE NEW EXCITING DEVELOPMENTS!"

3D Printing Industry Editor in Chief Michel Petch, shakes the hand of Josef Prusa, founder of wildcard 2019 Desktop FFF 3D Printer of the Year winner Prusa Research, for the Prusa i3 MK3. Photo by 3D Printing Industry

Desktop non-FFF 3D printer- Shortlist

Formlabs Form 2
Anycubic Photon
3DSystems FabPro 1000
Sinterit Lisa Pro (https://3dprintingindustry.com/news/review-sinterit-lisa-pro-industrial-desktop-sls-3d-printing-146024/)
Peopoly Moai 200
Photocentric Liquid Crystal Precision 1.5
Sharebot Rover
SprintRay Pro
Sisma Everes
B9 Core Series

Desktop non-FFF 3D printer of the year: Photocentric Liquid Crystal Precision 1.5

A spokesperson from the company stated, "We are truly proud and honoured to have won Desktop non-FFF Printer of the Year!"

“This mark of recognition for one of our earlier LCD innovations, Liquid Crystal Precision 1.5, is a sign of the hard work and dedication that everyone at Photocentric has poured into our unique method of LCD 3D printing. It is just a glimpse of what the future holds for Photocentric, we have been developing the next generation of LCD 3D printers that will revolutionize the additive manufacturing industry – these developments will firmly place LCD 3D printing in its rightful place as an effective method of custom mass manufacturing.”

> “THE PHOTOCENTRIC TEAM SAY A HUGE THANKS TO EVERYONE WHO VOTED, OUR FANTASTIC PARTNERS AND OF COURSE THE 3D PRINTING INDUSTRY TEAM.”

Nikita Chibisov, 3D Printing Software and Technical Development specialist, Photocentric, enthusiastically accepts Desktop Non-FFF 3D Printer of the Year for the Photocentric Liquid Crystal Precision 1.5. Photo by 3D Printing Industry

Enterprise 3D Printer (Metals) – Shortlist

Desktop Metal Studio System

EOS M400-4

Additive Industries MetalFABI

Aurora Labs S-TITANIUM PRO

Renishaw RenAM500Q
SLM Solutions 800HL
3DEO
[ExOne X1 25 PRO (https://3dprintingindustry.com/news/inside-the-x1-25pro-mid-scale-additive-manufacturing-platform-from-exone-144196/)](https://3dprintingindustry.com/news/inside-the-x1-25pro-mid-scale-additive-manufacturing-platform-from-exone-144196/)
Arcam Q10plus
COHERENT | OR LASER – CREATOR

Enterprise 3D Printer of the Year (Metals): Desktop Metal Studio System

"Desktop Metal is proud to receive the 2019 Enterprise 3D Printer of the Year in Metals award for our Studio System, the world's first and only office-friendly metal 3D printing solution," said Ric Fulop, CEO and co-founder of Desktop Metal.

"THIS RECOGNITION IS ESPECIALLY MOMENTOUS AS IT MARKS THE SECOND CONSECUTIVE YEAR THAT THE 3D PRINTING COMMUNITY HAS RECOGNIZED OUR INNOVATIVE TECHNOLOGY AND FURTHER VALIDATES OUR LEADERSHIP POSITION IN DRIVING THE ADOPTION OF METAL 3D PRINTING."

The Desktop Metal team take to the stage in acceptance of Enterprise 3D Printer of the Year (Metals) for the Studio System. Photo by 3D Printing Industry

Enterprise 3D Printer (Polymers) – Shortlist

Stratasys J750
HP JetFusion 300
Markforged X7
Roboze ARGO500
BigRep PRO
3D Systems Figure 4
EOS P500
Sintratec S2
INTAMSYS FUNMAT PRO 410
RPS NEO800 Stereolithography System

Enterprise 3D Printer of the Year (Polymers): Stratasys J750

Omer Krieger, EVP of Products at Stratasys, commented, “Every day, global customers such as Google Arts & Culture, LAIKA, and Audi seek to push creative boundaries with 3D printing – and we’re proud to deliver the technology necessary to make this possible,”

“The J750 is the world’s only full-colour, multi-material 3D printer – and just this year became one of the first 3D printing technologies to receive Pantone validation (https://3dprintingindustry.com/news/stratasys-j735-and-j750-receive-pantone-validated-mark-152552/). We’re thrilled to receive this award from the industry experts at 3D Printing Industry, and it’s even more meaningful knowing this was voted for by actual users themselves,”

> “THIS IS GREAT ACHIEVEMENT FOR STRATASYS, AS WELL AS OUR TEAMS AND PARTNERS AROUND THE WORLD.”

Justin Cunningham, Marketing Manager North East EMEA, Stratasys, accepts the award for 3019 Enterprise 3D Printer of the Year (Polymers) for the Stratasys J750. Photo by 3D Printing Industry

3D Printing for a Better World – Shortlist

e-NABLE
Open Bionics affordable bionic limbs
3D Systems and OpHeart's anotomical models through the Heart-in-Hand Pledge (https://3dprintingindustry.com/news/3d-systems-partners-with-opheart-fulfills-charitable-3d-printed-heart-in-hand-pledge-143952/)
Clean2Antarctica 3D printed, no-emission solar powered vehicle
NTU spinoff Nano Sun, 3D printed water filtering membranes
Hamilton Labs, 3D printed toilets for India
Abi Bush for FieldReady's 3D printing in disaster zones
WASP, village of Shamballa Gaia building
Family of the Future, Flam3D
SECORE International, 3D printed coral

3D Printing for a Better World winner: another wildcard entry for 2019, 3D Life Prints' anatomical models for patient care.

Henry Pinchbeck CEO 3D LifePrints on accepting the award, "When we started 3D LifePrints we wanted to create a company that has humanitarian values at its core, and that values people as highly as the technology,"

> "3D LIFEPRINTS' BUSINESS MODEL OF INTEGRATING 3D PRINTING INTO HOSPITALS (HTTPS://3DPRINTINGINDUSTRY.COM/NEWS/3D-LIFEPRINTS-SECURES-500000-EXPAND-HOSPITAL-BASED-3D-PRINTER-LABS-128118/) MEANS THAT OUR BIO-MEDICAL ENGINEERS WORK AS CLOSELY AS POSSIBLE WITH THE SURGEONS AND THIS HAS PRODUCED AMAZING RESULTS IN TERMS OF IMPROVING PATIENT OUTCOMES AND REDUCING COSTS,"

"This award means a lot to us as it reinforces our belief that our clients and partners agree with our stance, and it will drive us to work even harder to grow our business and the wider medical 3D printing market."

Henry Pinchbeck, CEO, 3D LifePrints, accepts the award for 2019 3D Printing for a Better World. This year, the trophy was awarded for 3D LifePrints' work in producing 3D printed anatomical models for patient care. Photo by 3D Printing Industry

Academic/Research Team – Shortlist

Complex Materials Group and Soft Materials Group at ETH Zurich, development of a liquid crystal polymer (LCP) material for 3D printers
Fraunhofer ILT, futureAM project (https://3dprintingindustry.com/news/fraunhofer-launches-futuream-reduce-cost-accelerate-metal-3d-printing-125402/)
The European Large Additive Subtractive Integrated Modular Machine (LASIMM) Consortium
Digital Reconfigurable Additive Manufacturing facilities for Aerospace (https://3dprintingindustry.com/news/streamlining-aerospace-industry-mtcs-digital-learning-factory-drama-project-134472/) (DRAMA) team from the MTC, UK
The Colorado School of Mines Alliance for the Development of Additive Processing Technologies (ADAPT)
University of Nottingham Institute for Advanced Manufacturing
The University of Sheffield's Advanced Manufacturing Research Centre (AMRC)
Damien Loterie, Paul Delrot and Christophe Moser at the Ecole Polytechnique de Lausanne, Volumetric 3D Printing
Open Architecture Additive Manufacturing (OAAM), The Welding Institute (TWI)
Ibo Matthews and the Laser Materials Group at Lawrence Livermore National Laboratory (LLNL)

Academic/Research Team of the Year: Digital Reconfigurable Additive Manufacturing facilities for Aerospace (DRAMA) team from the MTC, UK

Dr. Katy Milne, Chief Engineer, DRAMA Digital Engineering Group at the MTC, commented "This is fantastic recognition for the work of the DRAMA team at the midway point in the project,"

"DRAMA IS A WORLD CLASS COLLABORATION OF TECHNOLOGY COMPANIES, UNIVERSITIES, RTOS AND CLUSTER BODIES PUSHING THE BOUNDARIES ON TECH, CREATING CAPABILITY TO GIVE THE UK ADDITIVE AEROSPACE SUPPLY CHAIN COMPETITIVE ADVANTAGE. THE NEXT 18 MONTHS IS GOING TO BE REALLY EXCITING."

Katy Milne Chief Engineer of the Digital Reconfigurable Additive Manufacturing facilities for Aerospace (DRAMA) project at MTC accepts the 2019 Academic/Research Team of the Year award on behalf of her team. Photo by 3D Printing Industry

OEM (Enterprise) – Shortlist

EOS
GE Additive
VoxelJet
RIZE Inc.
EnvisionTec
Massivit
Union Tech
Apium Tech
Prodways
Xaar 3D Ltd.

OEM of the Year (Enterprise): GE Additive

Shaun Wootton, PR & Media Relation Leader at GE Additive, commented, “Awards received and [illegible]d in such high numbers – are particularly special and a great endorsement. Thanks from the entire team.”

Shaun Wootton, PR & Media Relation Leader at GE Additive, accepting his company's award for OEM of the Year (Enterprise) Photo by 3D Printing Industry

OEM (Personal) – Shortlist

Prusa Research
Ultimaker
MakerBot
E3D Online
Anycubic
XYZ Printing
BondTech
Anet
MiiCraft
Tiertime

M of the Year (Personal): E3D Online

“Wow! We can’t believe it and we’d just like to say an enormous thank you to everyone who voted for E3D as OEM of the Year for the second year running,” comments Clare Difazio, Head of Commercial at E3D Online.

> “AS OEM TO SOME OF THE INDUSTRY’S BIGGEST FDM 3D PRINTER MANUFACTURERS, WE AT E3D ARE HUMBLED TO REALIZE WITH THIS AWARD THAT THE DIFFERENCE WE’RE STRIVING FOR IS BEING RECOGNIZED AND APPRECIATED BY OUR CUSTOMERS, AND BY THE END USER,”

“It’s fantastic to see the expertise we bring to FDM extrusion being put to such varied uses across a wide number of industries & professions. We’re right in the middle of a truly exciting time for manufacturing, and absolutely honoured to say we’re a part of it. We were barely in existence 5 years ago: here’s to the next five years and beyond!”

Joshua Rowley and Sanjay Mortimer, the respective Director of Innovation, Commercial Director and co-founders of E3D Online, accept the award for 2019 OEM of the Year (Personal) Photo by 3D Printing Industry

Startup – Shortlist

Velo3D
Aerosint
Digital Alloys Inc.
Evolve Additive Solutions
Relativity Space
COBOD International
AON3D
9T Labs
TRIDITIVE
LEO Lane

Startup of the Year, presented by Arno Held, CVO at AM Ventures: Aerosint

"For the Aerosint team it's a true honor to be recognized by the industry for our efforts in making 3D printing multimaterial," commented Edouard Moens de Hase, Co-Founder and Managing Director at Aerosint.

"WITH THIS AWARD WE HOPE EVEN MORE COMPANIES WILL BE INTERESTED TO LEARN ABOUT AEROSINT AND START A COLLABORATION WITH US ON THE DEVELOPMENT OF THEIR INNOVATIVE MULTIMATERIAL APPLICATIONS."

From left to right: Michael Petch, Editor in Chief, 3D Printing Industry, Arno Held, Chief Venture Office at AM Ventures, Kevin Eckes R&D/Applications Engineer at 2019 Startup of the Year Aerosint, and Beau Jacskon, Senior Journalist, 3D Printing Industry. Photo by 3D Printing Industry

Material Company – Shortlist

Fillamentum
BASF
eSun
Filamentive
DSM Additive manufacturing
Solvay
Owens Corning
Pyrogenesis
UL, Plastics for Additive Manufacturing Program (https://3dprintingindustry.com/news/ul-introduces-blue-card-for-global-recognition-of-3d-printing-materials-146742/) "Blue Card"
CRP Technology

Material company of the Year: CRP Technology

“We are very honored to receive the 2019 Material company of the Year” award as developer of Windform (https://3dprintingindustry.com/news/crp-windform-3d-printed-composites-partner-with-energica-for-the-motoe-world-cup-148396/) ® TOP-LINE composite materials,” commented Franco Cevolini, VP and CTO at CRP Technology.

> “I WANT TO THANK ALL THE PEOPLE WHO VOTED US AND THE 3D PRINTING INDUSTRY STAFF FOR THE SUPPORT. AND, OF COURSE, CONGRATS TO ALL THE WINNERS!”

“Bringing home this specific award,” added Cevolini,” means a lot to us, it is a recognition for our long-standing activity in the 3D printing sector: the CRP Technology’s F1 background helped us responding to the demands of the international market, anticipating highly unique manufacturing solutions worldwide.”

Antonio [illegible] Additive Manufacturing Representative, CRP Technology, accepts the award for 2019 Material Company of the Year. Photo by 3D Printing Industry

Medical, Dental or Healthcare Application – Shortlist

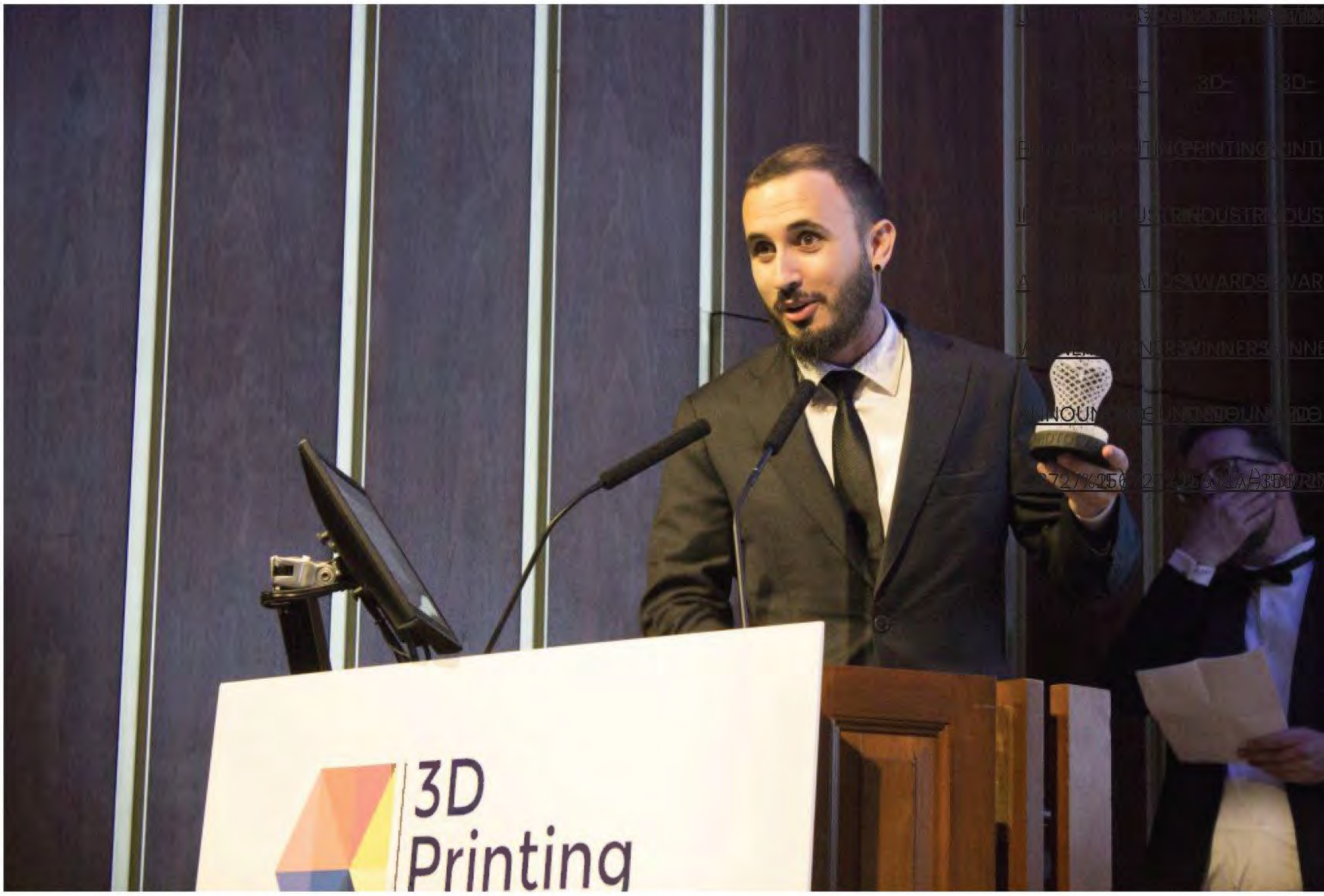
BCN3D Technologies and the University of Girona, A 3D printed device used to isolate cells from one of the most aggressive breast cancers (https://3dprintingindustry.com/news/desktop-3d-printed-pla-proven-to-help-researchers-in-pursuit-of-cancer-cure-145979/)
Stratasys, Guy's and St. Thomas' NHS Foundation Trust, 3D printed kidney models in the pre-surgical planning of a transplant for 2 year old boy
3D Life Prints, Anatomical models for patient care
Materialise, bioresorbable splint restores baby's collapsed bronchus
Newcastle University, 3D printing human corneas with CELLINK
Protolabs and Novax DMA, 3D printed cranial implant
3D Systems NextDent materials with FabPro and Figure 4 printers for Dental
Renishaw's 3D printed drug delivery port (https://3dprintingindustry.com/news/renishaw-3d-printed-medical-device-breaks-ground-in-parkinsons-drug-trial-150455/) for North Bristol NHS Trust's Parkinson's disease drug trial
Aalto University and Michigan Technological University's 3D printed customized labware and reaction vessels
Stryker, Tritanium TL Curved Posterior Lumbar Cage

Medical, Dental or Healthcare Application of the Year: BCN3D Technologies and the University of Girona

Xavi M.Faneca, CEO BCN3D Technologies, comments, "Five months ago it came to light that scientists from the University of Girona had successfully isolated breast cancer stem cells using the BCN3D Sigma R19 3D printer,"

"This investigation has been considered a very important milestone in the research of triple negative breast cancer, one of the most aggressive cancers with a high relapse rate,"

> "TOGETHER WITH THE UNIVERSITY OF GIRONA WE'RE VERY PROUD TO RECEIVE THIS AWARD BY 3D PRINTING INDUSTRY WHICH REFLECTS THE IMPORTANCE OF ADDITIVE MANUFACTURING IN THE HEALTHCARE FIELD."



Xavier Martínez Faneca, Co-Founder and CEO of BCN3D Technologies, accepts the award for 2019 Medical, Dental or Healthcare Application of the Year. This year, the trophy was awarded for BCN3D's work with the University of Girona to create a 3D printed device used to isolate breast cancer cells. Photo by Felix Li for 3D Printing Industry

Software Tool – Shortlist

Autodesk Fusion 360
Ultimaker Cura
SOLIDWORKS
Siemens NX AM tool set
Autodesk NetFabb
Markforged Eiger
3D Systems 3D Sprint
ANSYS Additive Suite
Link3D's AMES & Additive Workflow Software
3YOURMIND Agile MES

Software Tool of the Year: Ultimaker Cura

"We are thrilled to bring home the Software Tool of the Year Award from the 2019 3D Printing Industry Awards," commented Nuno Campos, Chief Marketing Officer at Ultimaker, "This is truly an amazing reward for the hard work and accomplishments of our entire team," "Every day, our many users rely on Ultimaker Cura to reliably print as quickly as possible. By continuously adding new industry-standard software integrations and material print profiles, we will continue to streamline our users' professional workflow for maximum efficiency.

"WE ARE VERY PROUD OF THIS ACKNOWLEDGEMENT AND WOULD LIKE TO THANK THE 3D PRINTING INDUSTRY TEAM FOR HOSTING A FANTASTIC EVENT."

Dick Moerkens (L), SVP R&D and Nuno Campos (R), CMO, Ultimaker, accept Cura's award for 2019 Software Tool of the Year. Photo by Felix Li for 3D Printing Industry

Creative Use of 3D Printing – Shortlist

BigRep NERA E-Motorcycle (https://3dprintingindustry.com/news/watch-bigrep-takes-nera-a-fully-functional-3d-printed-electric-motorcycle-for-a-ride-143949/)
Materialise Black Panther costumes
Polymaker, Coin Robotics & Shanghai Construction Group's 3D printed composite bridge
LAIKA and Stratasys, life-like characters for feature film "The Missing Link"
MIT Tangible Media Lab, SensorKnit
Scan the World, Bust of a Bearded Man acquired by the V&A Cast Courts

(https://3dprintingindustry.com/news/va-museum-adds-scan-the-world-to-cast-courts-permanent-collection-147822/)
Deeptime, Ionic Sound System
Microlight3D, world's smallest 3D printed portrait of artist (https://3dprintingindustry.com/news/sliced-masterspool-accenture-ctc-sintratec-eos-simufact-additive-nano-dimension-sciaky-135696/) Michel Paysant
Emerging Objects, Cabin of Curiosities
DWS, XCluster for lost wax casting trees

Creative Use of 3D Printing winner: BigRep NERA E-Motorcycle

"We are thrilled about the award for our prototype NERA, the world's first fully 3D-printed, functional e-motorcycle," commented Daniel Büning, CIO BigRep, Managing Director NOWLAB. "With our creative use of 3D printing, we have demonstrated the unprecedented capacity of FFF large-scale 3D printing technology in AM. To us, the award also confirms BigRep's ability as an innovation leader bringing new echnologies from design to reality – in this case in only 12 weeks – providing an added-value market lead for industrial customers,"

> "ON BEHALF OF THE DESIGN AND ENGINEERING TEAMS AT NOWLAB, WE'D LIKE TO THANK ALL OF YOU WHO VOTED FOR NERA. WE PROMISE TO EXCITE YOU AGAIN WITH CUTTING-EDGE DESIGNS!""

Mirek Classen, Head of Innovation at BigRep's NOWLAB that built the award-winning NERA e-motorcycle, speaks at the 2019 3D Printing Industry Awards. Photo by 3D Printing Industry

3D Scanning/Metrology Company – Shortlist

Artec 3D
FARO
Creaform
GOM
Nikon Metrology
Perceptron
Renishaw
Shining3D
Thor3D
ZEISS

3D Scanning/Metrology Company of the Year: Artec 3D

"With the release of our metrology-grade desktop scanner Artec Micro, and before that, our long-distance laser scanner Artec Ray, the metrology market has become a very significant one for us, so we are especially proud to be recognized in this area by 3D Printing Industry readers," commented Artec 3D CEO Art Yukhin.

"WE WOULD LIKE TO EXPRESS OUR GRATITUDE TO EVERYONE WHO CAST THEIR VOTE FOR ARTEC 3D AND MADE IT POSSIBLE FOR US TO CLAIM THE TOP SPOT IN SUCH AN IMPORTANT NOMINATION."

The official 2019 3D Printing Industry Awards trophy manufactured by Protolabs. Photo by 3D Printing Industry

Consumer Product – Shortlist

Carbon & adidas Futurecraft 4D 3D printed sneaker midsoles
Align Technology Inc. and 3D Systems, Invisalign custom dental aligners
Batch.Works, 3D printed stationery for Paperchase
Carbon, the Riddell Speedflex Precision Diamond football helmet
EOS and Erpro Group, the 3D printed brush tip of Chanel Le Volume Révolution mascara
EOS and Hexo Helmets bicycle helmets
Formlabs and Gillette RazorMaker project
IKEA Israel, Milbat and Access Israel, ThisAbles
[illegible]
Reebok & BASF, Liquid Speed shoe

Consumer Product of the Year: Carbon & adidas Futurecraft4D 3D printed sneaker midsoles

Carbon's Chief Customer Officer, Phil DeSimone, comments, "Carbon is incredibly excited to accept the 3D Printing Industry Award's 2019 Consumer Product of the Year for the Futurecraft 4D."

> "THIS AWARD VALIDATES THE WORK WE'RE DOING EVERY DAY, AND WE LOOK FORWARD TO CONTINUING TO PARTNER WITH FORWARD THINKING COMPANIES LIKE ADIDAS TO MAKE PREVIOUSLY UN-MAKEABLE PRODUCTS AT SPEEDS AND VOLUMES NEVER BEFORE POSSIBLE."

For all of the latest updates from 3D Printing Industry Award winners and more subscribe to our newsletter (https://3dprintingindustry.com/newsletter), follow us on Twitter (https://twitter.com/3dprintindustry), and like us on Facebook (https://facebook.com/3dprintingindustry). Find talent for a project, or advance your career in 3D printing – join 3D Printing Jobs (https://jobs.3dprintingindustry.com/) to apply and advertise.

Featured image shows the 3D Printing Industry team onstage with all winners of the 2019 3D Printing Industry Award. Photo by Vickie Licková for 3D Printing Industry

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2019 3D Printing Industry Awards winners announced

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PRINTING PRINTING PRINTING PRINTING

INDUSTRY INDUSTRY INDUSTRY INDUSTRY

AWARDS AWARDS AWARDS AWARDS

WINNERS WINNERS WINNERS WINNERS

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156727%25 156727%25 156727%25 156727%25

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- **7K Followers (https://www.linkedin.com/company/3d-printing-industry)**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECLARATION OF JOSEF PRUSA

I, JOSEF PRUSA, declare:

1. I am a citizen of the Czech Republic and I am employed by Prusa Research s.r.o. ("Prusa Research"). My title at Prusa Research is CEO.

2. I have knowledge of the business operations of Prusa Research within the United States.

3. In my opinion, based on my time working at Prusa Research and all that I have

3. In my opinion, based on my time working at Prusa Research and all that I have read and seen, I believe that Prusa Research is considered to be one of the leading makers of 3D printers in the world.

4. Based on information that I have studied, the worldwide market share of Prusa Research within the market for desktop 3D printers is approximately 18%.

5. Based on information that I have studied, the market share of Prusa Research within the market for desktop 3D printers within the United States is approximately 10%.

6. To date, Prusa Research has sold approximately 50,000 (fifty-thousand) 3D printers to customers in the States.

7. To date, Prusa Research has sold approximately $ 42 million worth of goods to customers in the United States.

8. As of late 2019, the monthly revenue received by Prusa Research from sales to customers in the United States is approximately $ 2 million.

9. As of late 2019, approximately 30% of the internet traffic coming to websites operated by Prusa Research originates from internet users located in the United States.

10. As of late 2019, Prusa Research manufactures at its factory in Prague, Czech Republic, approximately 450 (four-hundred-fifty) 3D printers each business day.

11. As of late 2019, Prusa Research employs approximately 300 people.

12. I have been informed that, based on research conducted by the consulting and accounting firm of Deloitte. Prusa Research was named the Number 1 fastest growing

technology company in Central Europe. Based on my experience in the management of Prusa Research and within the technology industry in the Czech Republic, this research finding by Deloitte seems accurate and reasonable.

13. PRUSA POLYMERS is a trademark that is used by Prusa Research in connection with the sale of supplies for 3D printers, and especially for filament used for 3D printing.

14. To date, Prusa Research has shipped approximately 100,000 (one-hundred-thousand) spools of filament for use with 3D printers to customers located in the United States.

15. Prusa Research, as a company, typically participates in or attends annually between 2 and 5 trade shows or conferences held in the United States.

16. The trademark ORIGINAL PRUSA is used in connection with the sale of the most popular 3D printer offered by Prusa Research.

17. The 3D printer sold under the trademark ORIGINAL PRUSA has won numerous industry awards and is widely considered a leading product in the 3D printing industry, including by consumers of 3D printing products in the United States.

18. The ORIGINAL PRUSA brand of 3D printer includes components that are bright orange in color. This bright orange color has become known throughout the 3D printing industry as a characteristic feature of 3D printers sold by Prusa Research.

19. I believe that the color orange has become distinctive in the minds of consumers in the 3D printing industry in the United States as a characteristic feature of 3D printers sold by Prusa Research.

20. Prusa Research sells filament for use with 3D printers under the trademark PRUSAMENT, through the broader brand of PRUSA POLYMERS.

21. The trademark PRUSA ORANGE is used in connection with the sale of filament for 3D printers that is a particular shade of bright orange that is known in the 3D printing industry as being associated with products from Prusa Research.

22. The 3D printers currently sold by Prusa Research are generally considered to be for home, hobby, or educational use and are not considered to be for professional use because such 3D printers are priced under $1,000.

23. Prusa Research currently plans to release in late 2020 a higher end 3D printer which will target the professional printer market at a higher price point. The trademark PRUSA PRO will be used in connection with this professional-level printer.

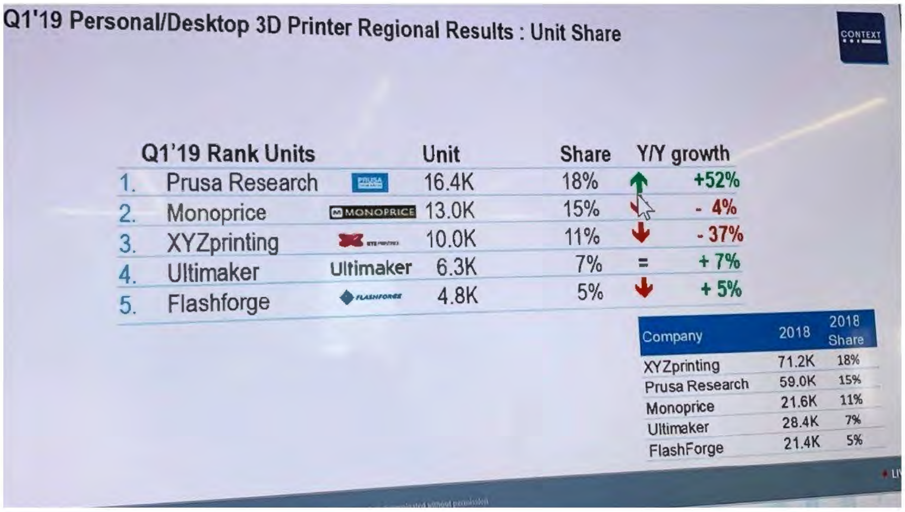
I declare under penalty of perjury under the laws of the country of the Czech Republic that the foregoing is true and correct to the best of my knowledge and understanding.

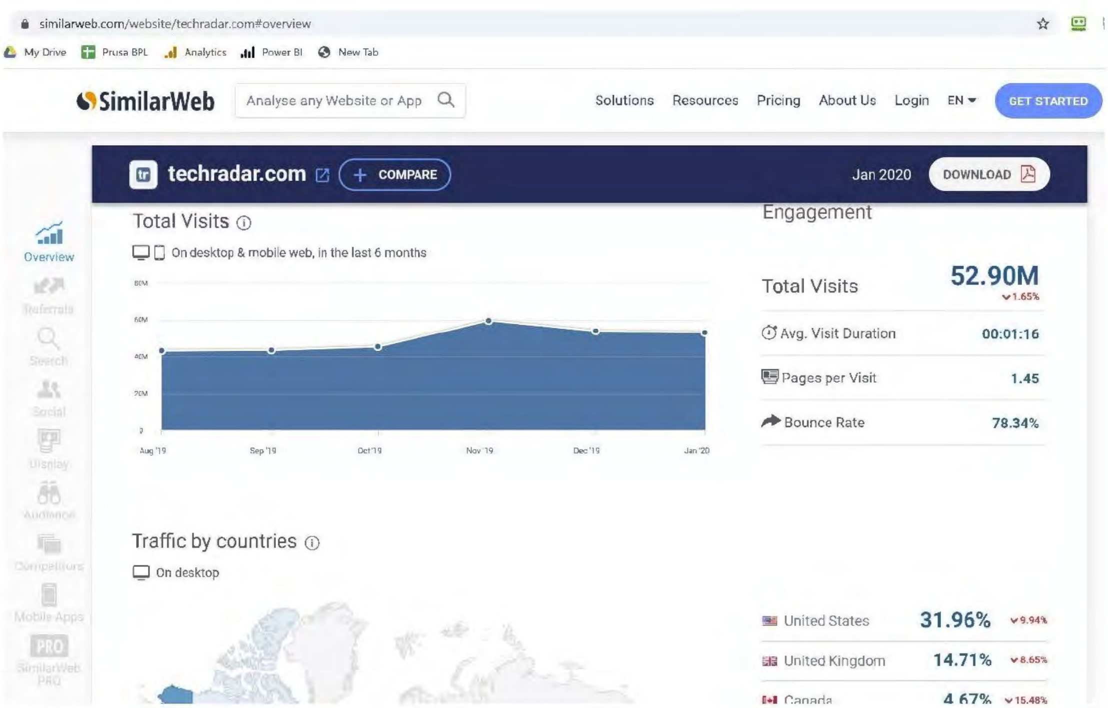
Dated: 24.2.2020

By: ____________________

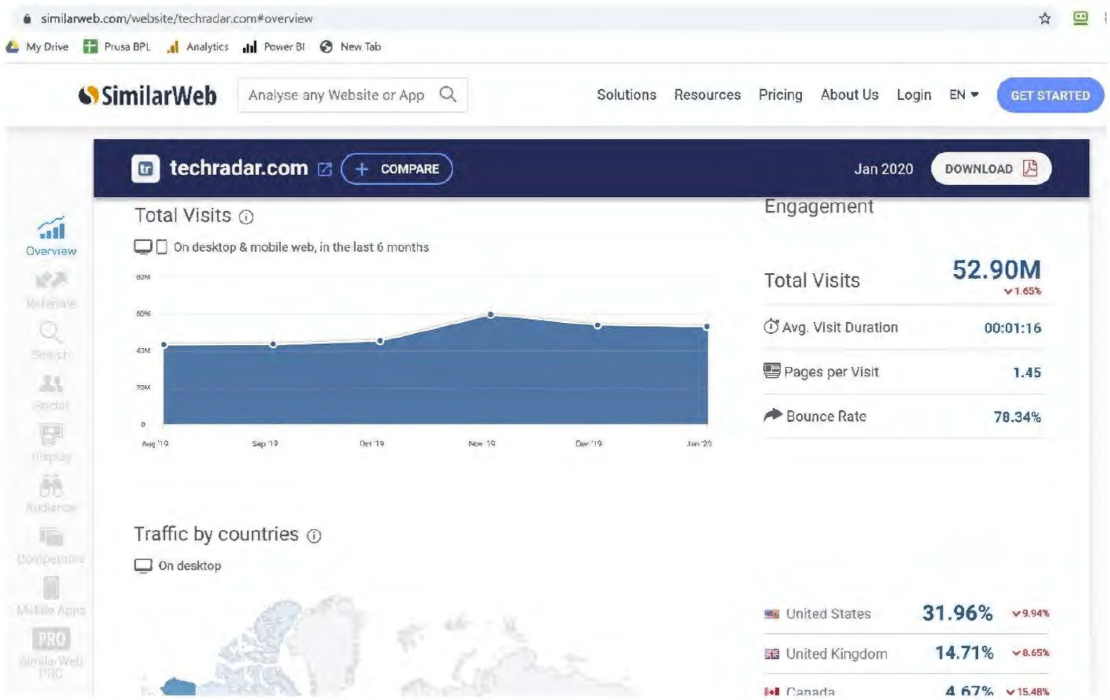
JOSEF PRUSA
for Prusa Research s.r.o.

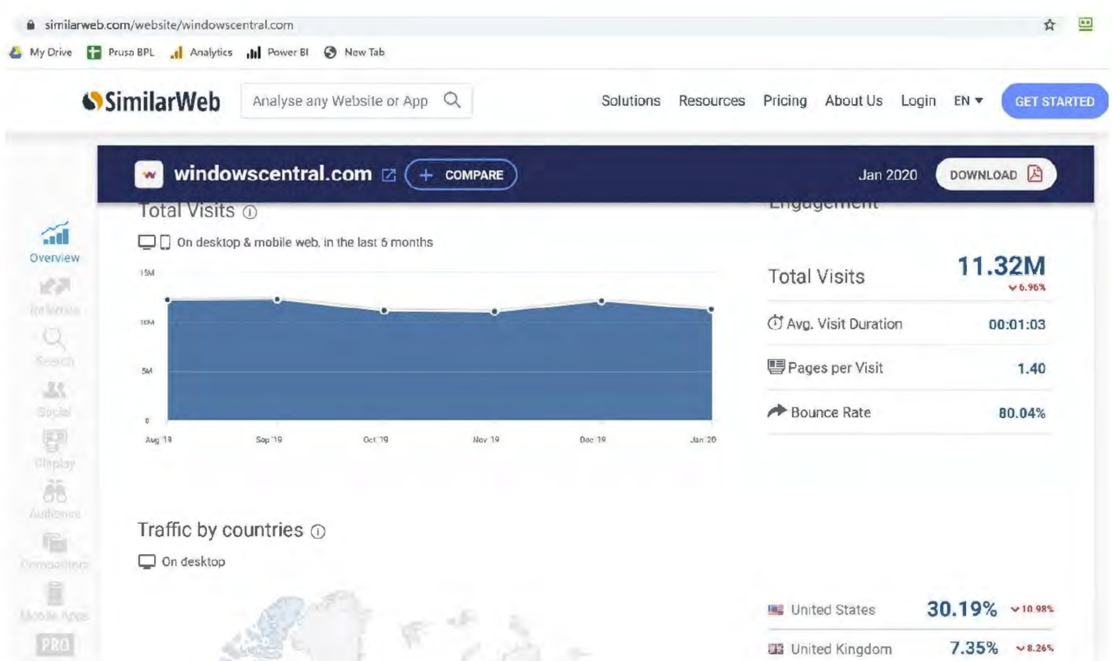
Screen captures of analytics data in support of the acquired distinctiveness of PRUSA under Section 2(f):

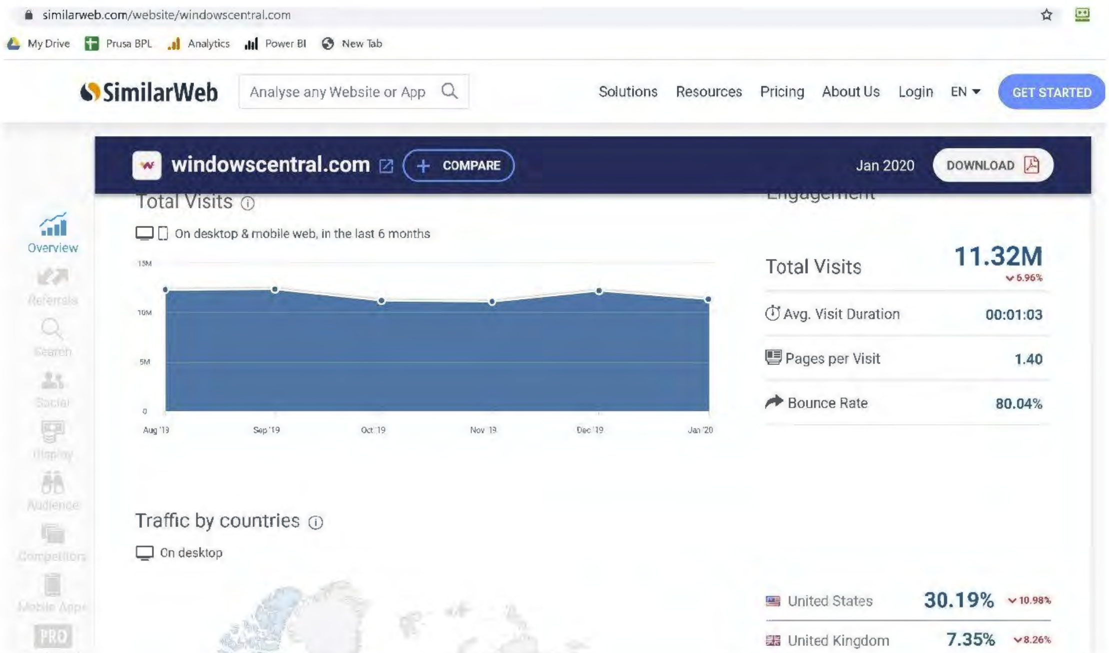


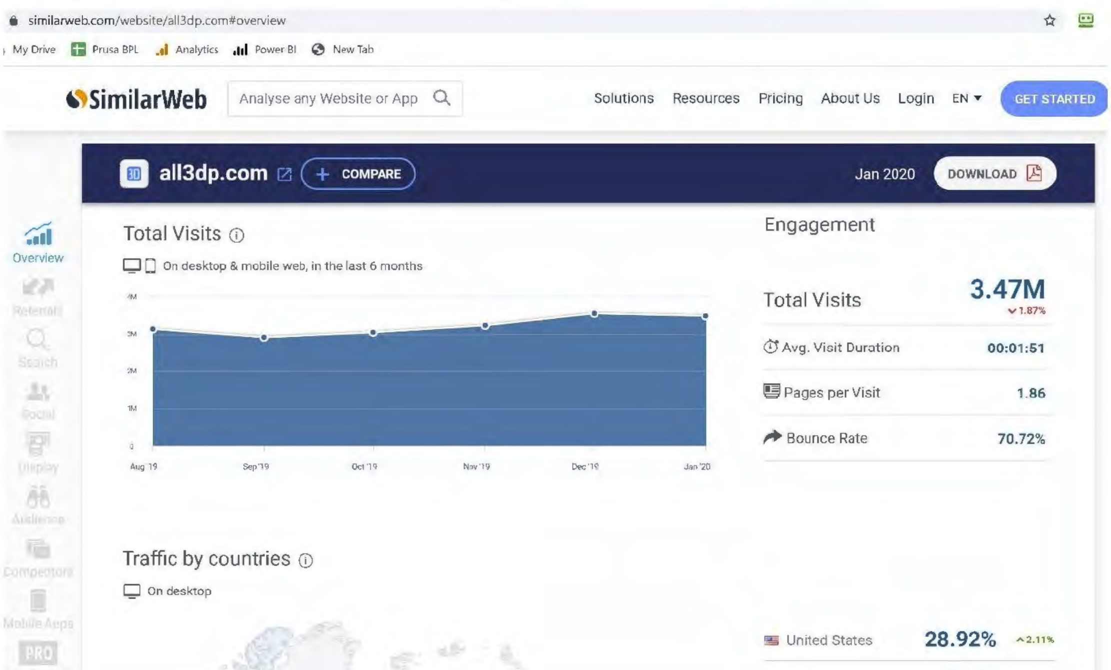


Screen captures of analytics data in support of the acquired distinctiveness of PRUSA under Section 2(f):






similarweb.com/website/windowscentral.com
My Drive
Prusa BPL
Analytics
Power BI
New Tab
SimilarWeb
Analyse any Website or App
Solutions
Resources
Pricing
About Us
Login
EN
GET STARTED
windowscentral.com
COMPARE
Jan 2020
DOWNLOAD
Total Visits
On desktop & mobile web, in the last 6 months
Engagement
Total Visits
11.32M
6.96%
Avg. Visit Duration
00:01:03
Pages per Visit
1.40
Bounce Rate
80.04%
Overview
Traffic by countries
On desktop
United States
30.19%
10.98%
United Kingdom
7.35%
8.26%


similarweb.com/website/all3dp.com#overview
My Drive
Prusa BPL
Analytics
Power BI
New Tab
SimilarWeb
Analyse any Website or App
Solutions
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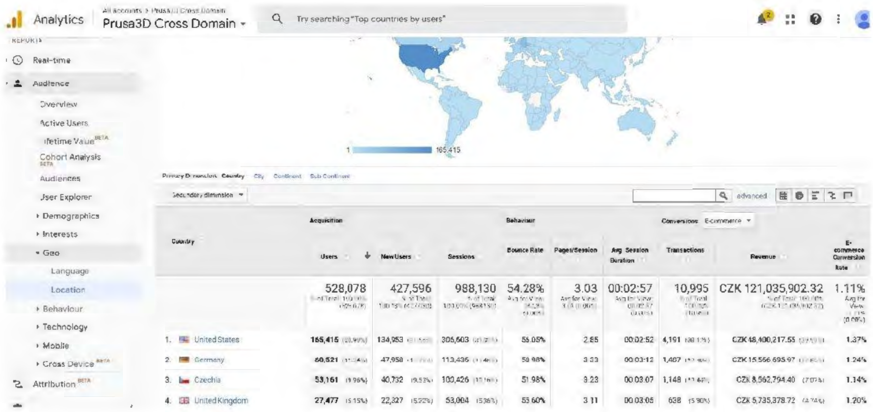
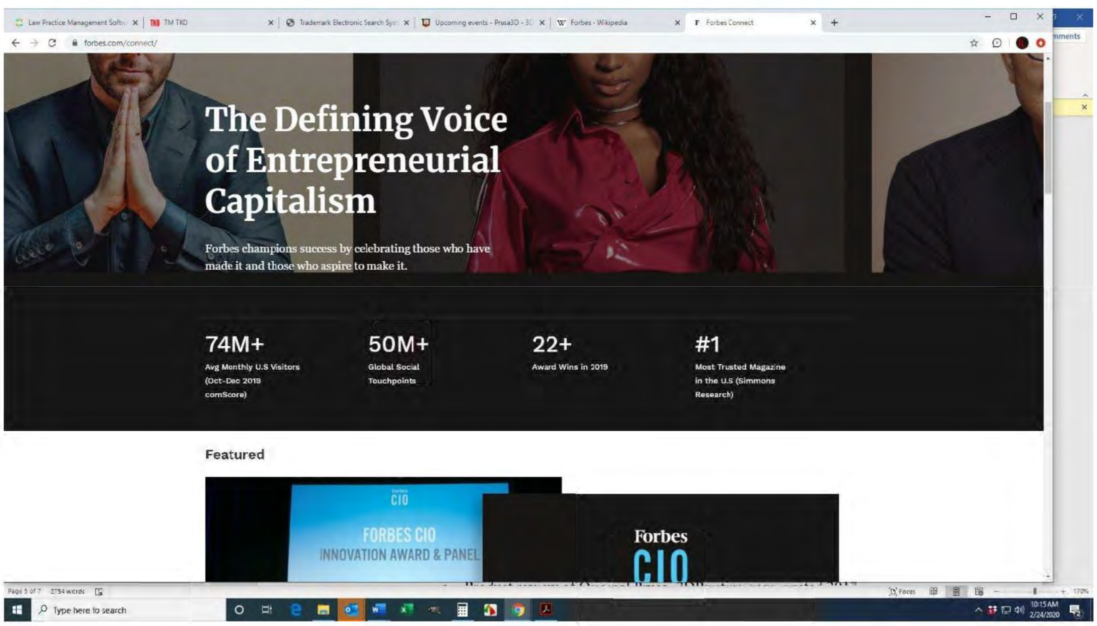
Pricing
About Us
Login
EN
GET STARTED
all3dp.com
COMPARE
Jan 2020
DOWNLOAD
Total Visits
On desktop & mobile web, in the last 6 months
Engagement
Total Visits
3.47M
1.87%
Avg. Visit Duration
00:01:51
Pages per Visit
1.86
Bounce Rate
70.72%
Overview
Traffic by countries
On desktop
United States
28.92%
2.11%


Analytics
Prusa3D Cross Domain
Try searching "Top countries by users"
Real-time
Audience
Overview
Active Users
Lifetime Value
Cohort Analysis
Audiences
User Explorer
Demographics
Interests
Geo
Language
Location
Behaviour
Technology
Mobile
Cross Device
Attribution
Primary Dimension: Country City Continent Sub Continent
Secondary dimension
advanced
Acquisition
Behaviour
Conversions E-commerce
Country
Users
New Users
Sessions
Bounce Rate
Pages/Session
Avg. Session Duration
Transactions
Revenue
E-commerce Conversion Rate
528,078 427,596 988,130 54.28% 3.03 00:02:57 10,995 CZK 121,035,902.32 1.11%
1. United States 165,415 134,953 306,603 55.05% 2.85 00:02:52 4,191 CZK 48,400,217.55 1.37%
2. Germany 60,521 47,958 113,436 50.98% 3.33 00:03:12 1,407 CZK 15,566,695.97 1.24%
3. Czechia 53,161 (9.96%) 40,732 (9.53%) 100,426 51.98% 3.23 00:03:07 1,148 CZK 8,562,794.40 (7.07%) 1.14%
4. United Kingdom 27,477 (5.15%) 22,327 (5.22%) 53,004 (5.36%) 53.60% 3.11 00:03:05 638 (5.80%) CZK 5,735,378.72 1.20%


Law Practice Management Softw
TM TKD
Trademark Electronic Search Sys
Upcoming events - Prusa3D
Forbes - Wikipedia
Forbes Connect
forbes.com/connect/
The Defining Voice of Entrepreneurial Capitalism
Forbes champions success by celebrating those who have made it and those who aspire to make it.
74M+
Avg Monthly U.S Visitors (Oct-Dec 2019 comScore)
50M+
Global Social Touchpoints
22+
Award Wins in 2019
#1
Most Trusted Magazine in the U.S (Simmons Research)
Featured
FORBES CIO INNOVATION AWARD & PANEL
Forbes
CIO
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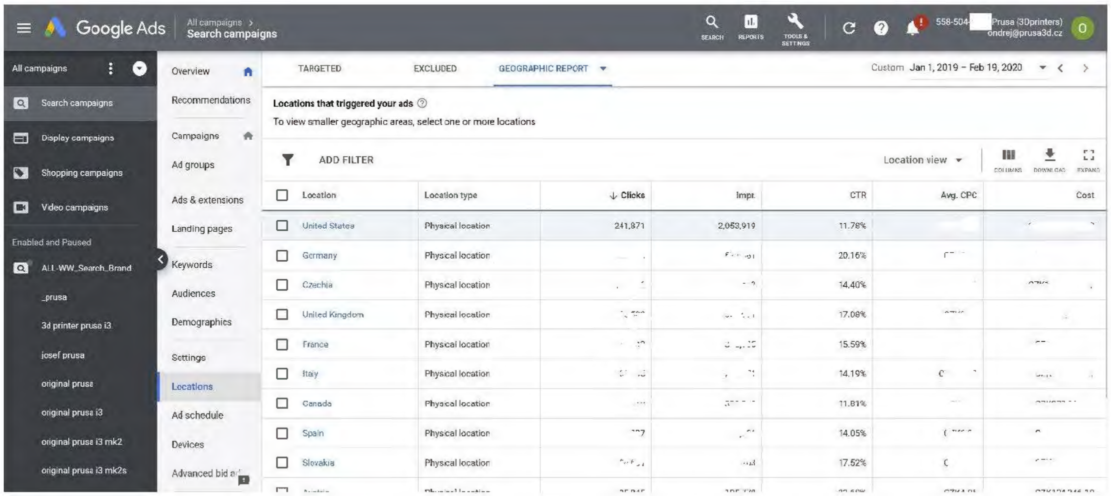
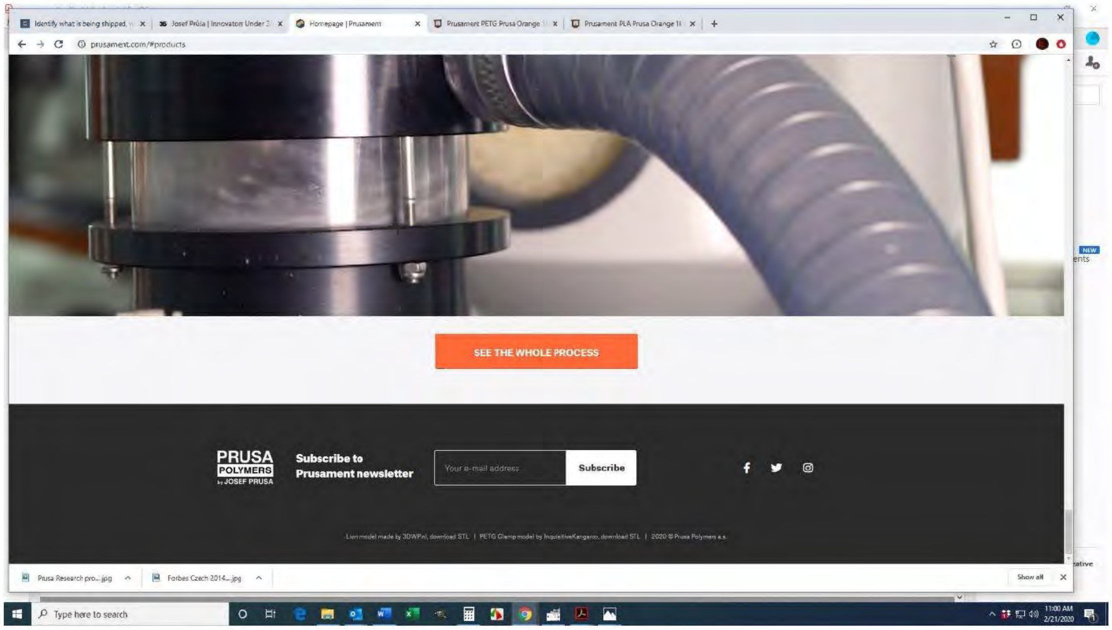
2/24/2020

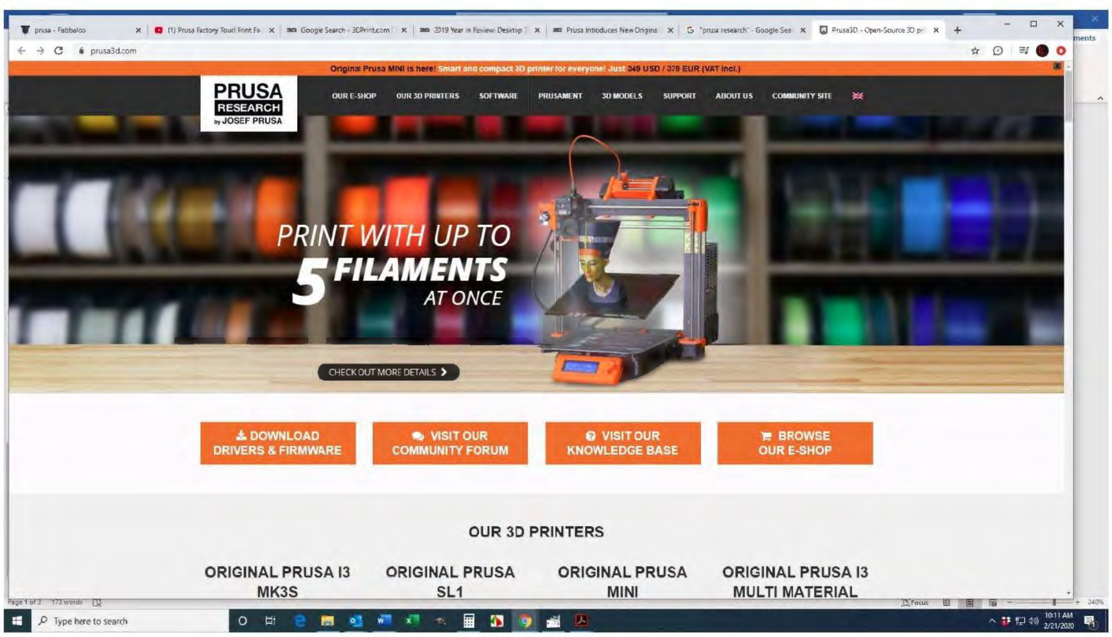


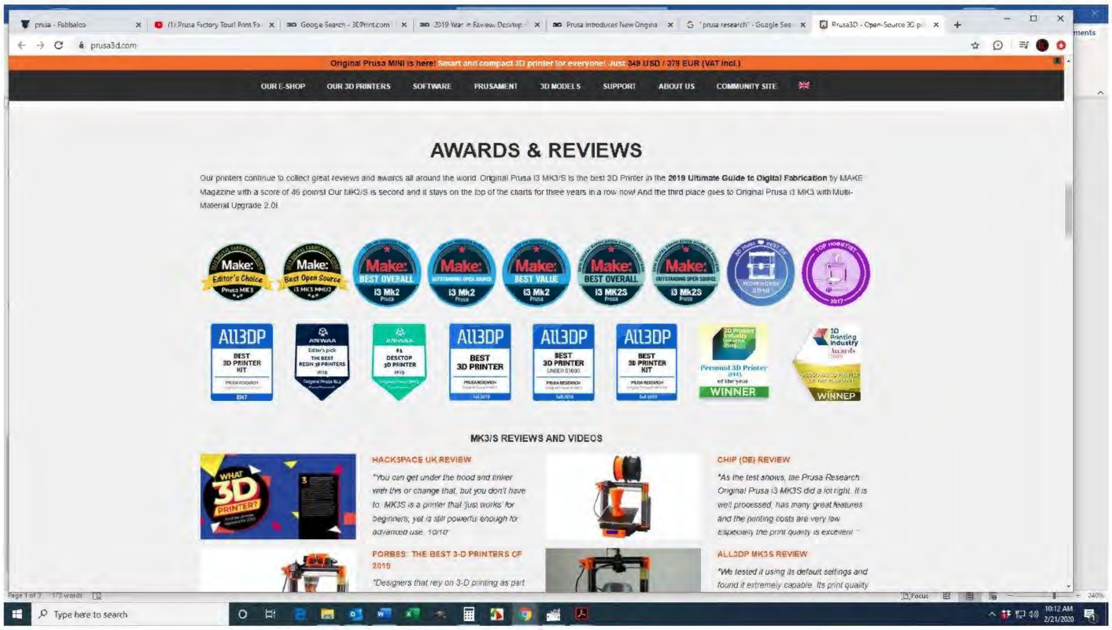
Google Ads
All campaigns
Search campaigns
All campaigns
Search campaigns
Display campaigns
Shopping campaigns
Video campaigns
Enabled and Paused
ALL-WW_Search_Brand
_prusa
3d printer prusa i3
josef prusa
original prusa
original prusa i3
original prusa i3 mk2
original prusa i3 mk2s
Overview
Recommendations
Campaigns
Ad groups
Ads & extensions
Landing pages
Keywords
Audiences
Demographics
Settings
Locations
Ad schedule
Devices
TARGETED
EXCLUDED
GEOGRAPHIC REPORT
Custom Jan 1, 2019 – Feb 19, 2020
Locations that triggered your ads
To view smaller geographic areas, select one or more locations
ADD FILTER
Location view
Location
Location type
Clicks
Impr.
CTR
Avg. CPC
Cost
United States
Physical location
241,871
2,053,919
11.78%
Germany
Physical location
20.16%
Czechia
Physical location
14.40%
United Kingdom
Physical location
17.08%
France
Physical location
15.59%
Italy
Physical location
14.19%
Canada
Physical location
11.81%
Spain
Physical location
14.05%
Slovakia
Physical location
17.52%

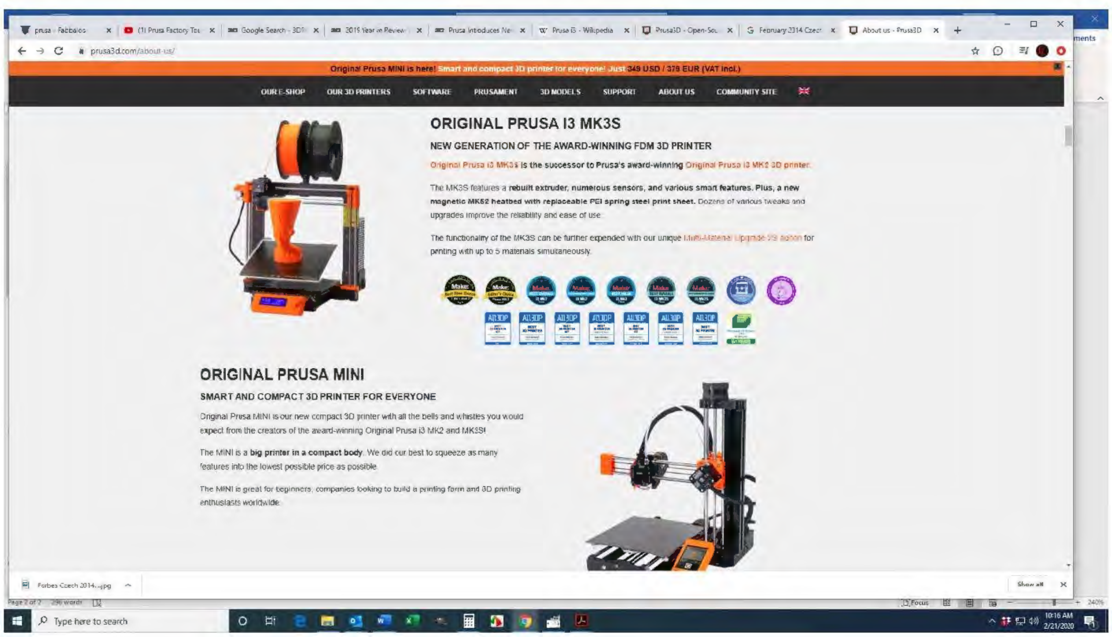
Things Looking Good For Prusa
fabbaloo.com/blog/2017/1/18/things-looking-good-for-prusa-research?rq=prusa
Fabbaloo
3D PRINTING NEWS
PRUSA
RESEARCH
by JOSEF PRUSA
WE'RE SHIPPING 3000 3D PRINTERS
EVERYONE IS A MAKER ONLY I AM A PRINTER
PRUSA
Type here to search
9:55 AM
2/21/2020

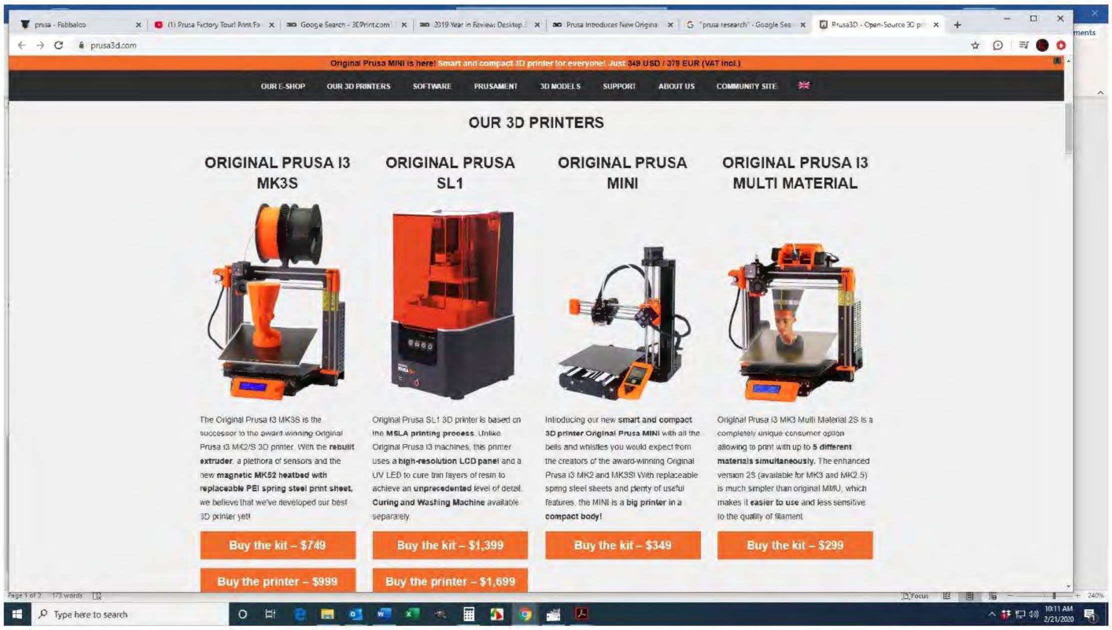
Images showing Applicant's goods and Applicant's website, in support of the acquired distinctiveness of PRUSA under Section 2(f):

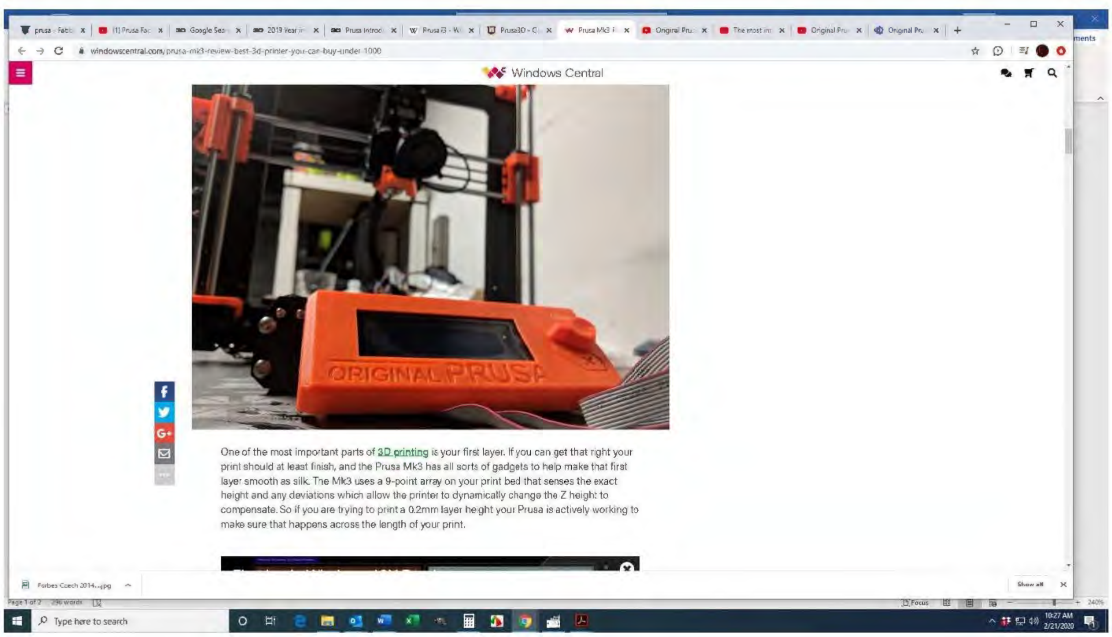




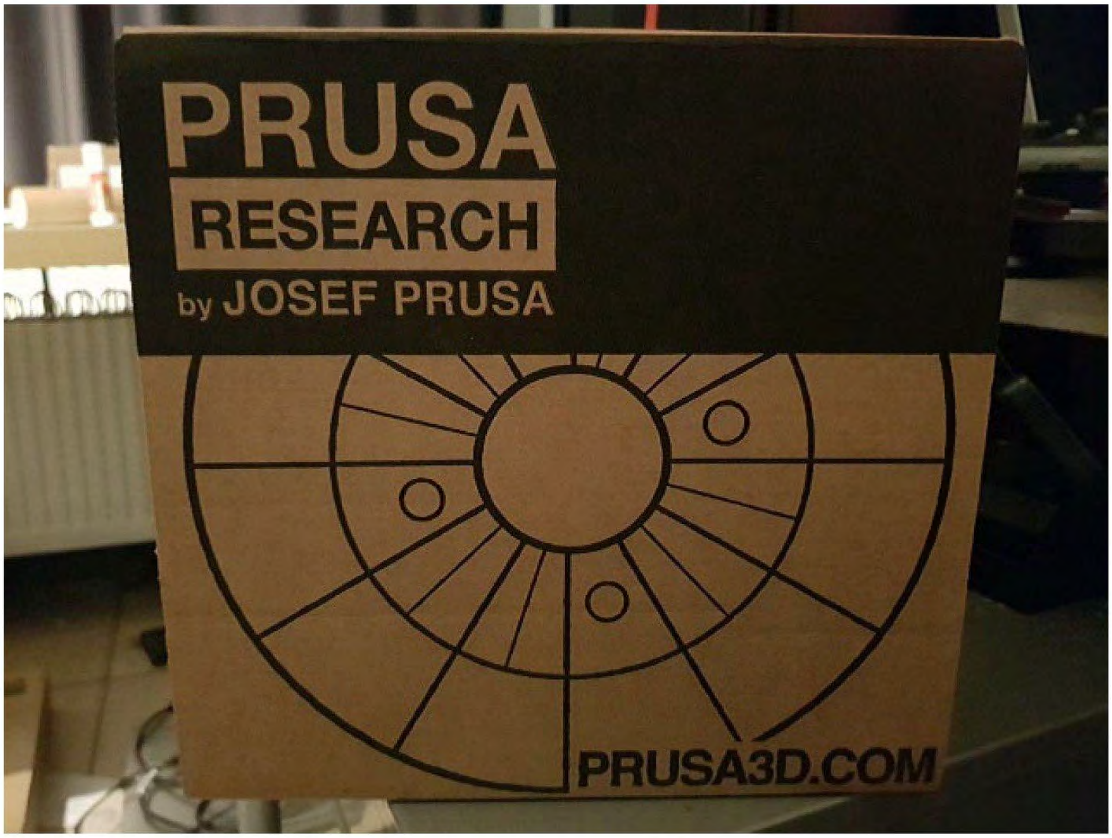

prusa3d.com
Original Prusa MINI is here! Smart and compact 3D printer for everyone! Just 349 USD / 379 EUR (VAT incl.)
OUR E-SHOP
OUR 3D PRINTERS
SOFTWARE
PRUSAMENT
3D MODELS
SUPPORT
ABOUT US
COMMUNITY SITE
AWARDS & REVIEWS
Our printers continue to collect great reviews and awards all around the world. Original Prusa i3 MK3/S is the best 3D Printer in the 2019 Ultimate Guide to Digital Fabrication by MAKE Magazine with a score of 46 points! Our MK2/S is second and it stays on the top of the charts for three years in a row now! And the third place goes to Original Prusa i3 MK3 with Multi-Material Upgrade 2.0!
MK3/S REVIEWS AND VIDEOS
HACKSPACE UK REVIEW
"You can get under the hood and tinker with this or change that, but you don't have to. MK3S is a printer that 'just works' for beginners, yet is still powerful enough for advanced use. 10/10"
CHIP (DE) REVIEW
"As the test shows, the Prusa Research Original Prusa i3 MK3S did a lot right. It is well processed, has many great features and the printing costs are very low. Especially the print quality is excellent."
FORBES: THE BEST 3-D PRINTERS OF 2019
"Designers that rely on 3-D printing as part
ALL3DP MK3S REVIEW
"We tested it using its default settings and found it extremely capable. Its print quality
Type here to search


prusa3d.com/about-us/
Original Prusa MINI is here! Smart and compact 3D printer for everyone! Just 349 USD / 379 EUR (VAT incl.)
OUR E-SHOP
OUR 3D PRINTERS
SOFTWARE
PRUSAMENT
3D MODELS
SUPPORT
ABOUT US
COMMUNITY SITE
ORIGINAL PRUSA I3 MK3S
NEW GENERATION OF THE AWARD-WINNING FDM 3D PRINTER
Original Prusa i3 MK3S is the successor to Prusa's award-winning Original Prusa i3 MK2 3D printer.
The MK3S features a rebuilt extruder, numerous sensors, and various smart features. Plus, a new magnetic MK52 heatbed with replaceable PEI spring steel print sheet. Dozens of various tweaks and upgrades improve the reliability and ease of use.
The functionality of the MK3S can be further expended with our unique Multi-Material Upgrade 2S addon for printing with up to 5 materials simultaneously.
ORIGINAL PRUSA MINI
SMART AND COMPACT 3D PRINTER FOR EVERYONE
Original Prusa MINI is our new compact 3D printer with all the bells and whistles you would expect from the creators of the award-winning Original Prusa i3 MK2 and MK3S!
The MINI is a big printer in a compact body. We did our best to squeeze as many features into the lowest possible price as possible.
The MINI is great for beginners, companies looking to build a printing farm and 3D printing enthusiasts worldwide.
Type here to search


prusa3d.com
Original Prusa MINI is here! Smart and compact 3D printer for everyone! Just 349 USD / 379 EUR (VAT incl.)
OUR E-SHOP
OUR 3D PRINTERS
SOFTWARE
PRUSAMENT
3D MODELS
SUPPORT
ABOUT US
COMMUNITY SITE
OUR 3D PRINTERS
ORIGINAL PRUSA I3 MK3S
ORIGINAL PRUSA SL1
ORIGINAL PRUSA MINI
ORIGINAL PRUSA I3 MULTI MATERIAL
The Original Prusa i3 MK3S is the successor to the award-winning Original Prusa i3 MK2/S 3D printer. With the rebuilt extruder, a plethora of sensors and the new magnetic MK52 heatbed with replaceable PEI spring steel print sheet, we believe that we've developed our best 3D printer yet!
Original Prusa SL1 3D printer is based on the MSLA printing process. Unlike Original Prusa i3 machines, this printer uses a high-resolution LCD panel and a UV LED to cure thin layers of resin to achieve an unprecedented level of detail. Curing and Washing Machine available separately.
Introducing our new smart and compact 3D printer Original Prusa MINI with all the bells and whistles you would expect from the creators of the award-winning Original Prusa i3 MK2 and MK3S! With replaceable spring steel sheets and plenty of useful features, the MINI is a big printer in a compact body!
Original Prusa i3 MK3 Multi Material 2S is a completely unique consumer option allowing to print with up to 5 different materials simultaneously. The enhanced version 2S (available for MK3 and MK2.5) is much simpler than original MMU, which makes it easier to use and less sensitive to the quality of filament.
Buy the kit – $749
Buy the kit – $1,399
Buy the kit – $349
Buy the kit – $299
Buy the printer – $999
Buy the printer – $1,699
Type here to search


windowscentral.com/prusa-mk3-review-best-3d-printer-you-can-buy-under-1000
Windows Central
ORIGINAL PRUSA
One of the most important parts of 3D printing is your first layer. If you can get that right your print should at least finish, and the Prusa Mk3 has all sorts of gadgets to help make that first layer smooth as silk. The Mk3 uses a 9-point array on your print bed that senses the exact height and any deviations which allow the printer to dynamically change the Z height to compensate. So if you are trying to print a 0.2mm layer height your Prusa is actively working to make sure that happens across the length of your print.
Type here to search


PRUSA
POLYMERS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RESEARCH
by JOSEF PRUSA
PRUSA3D.COM


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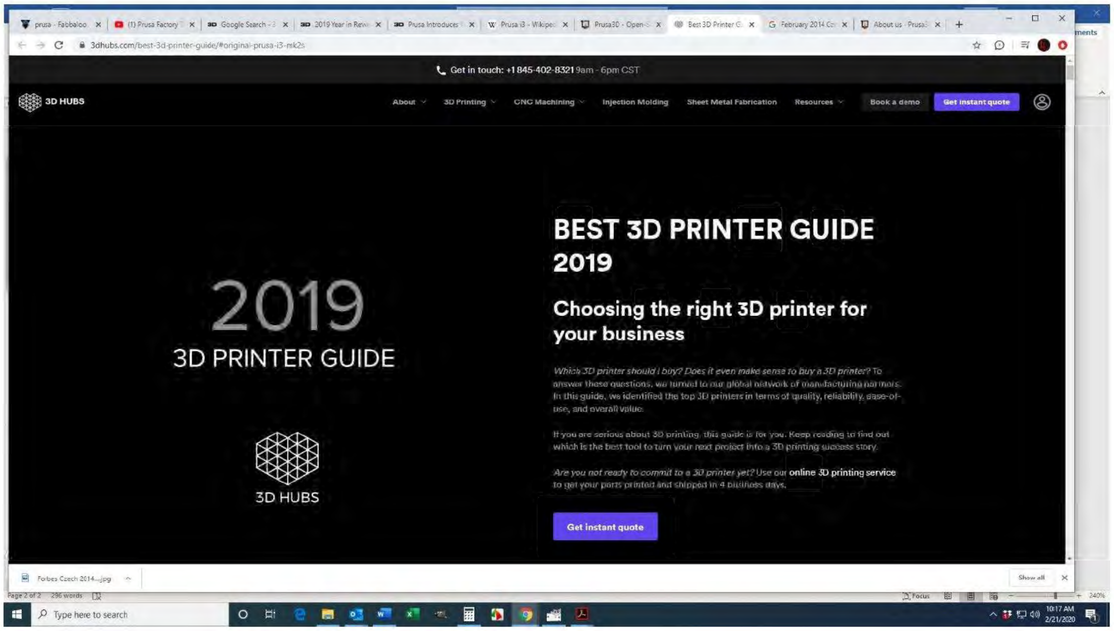
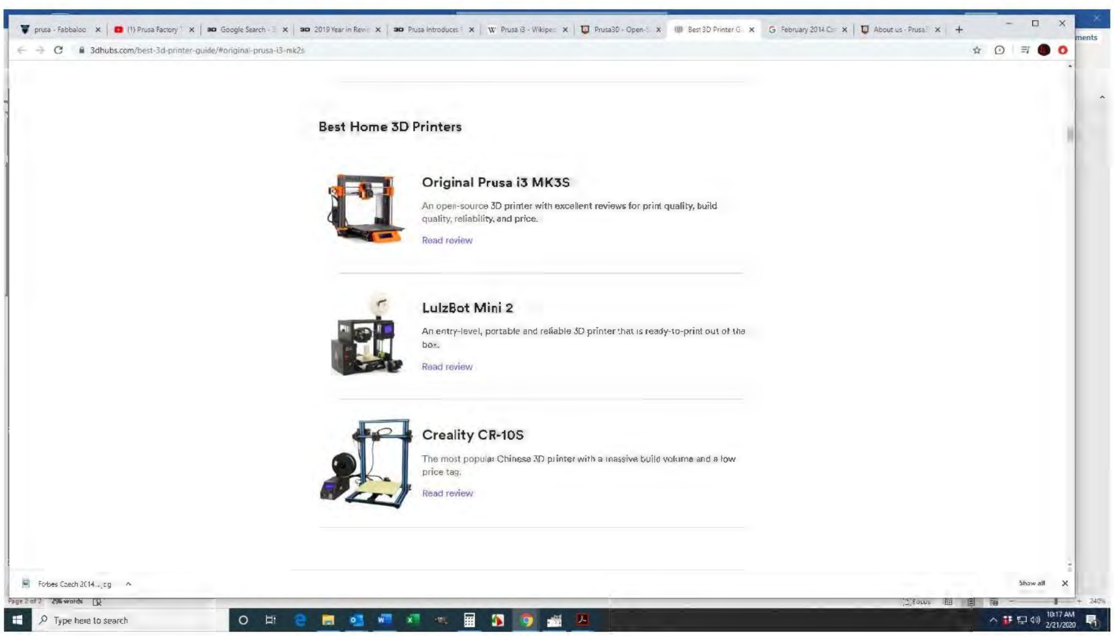
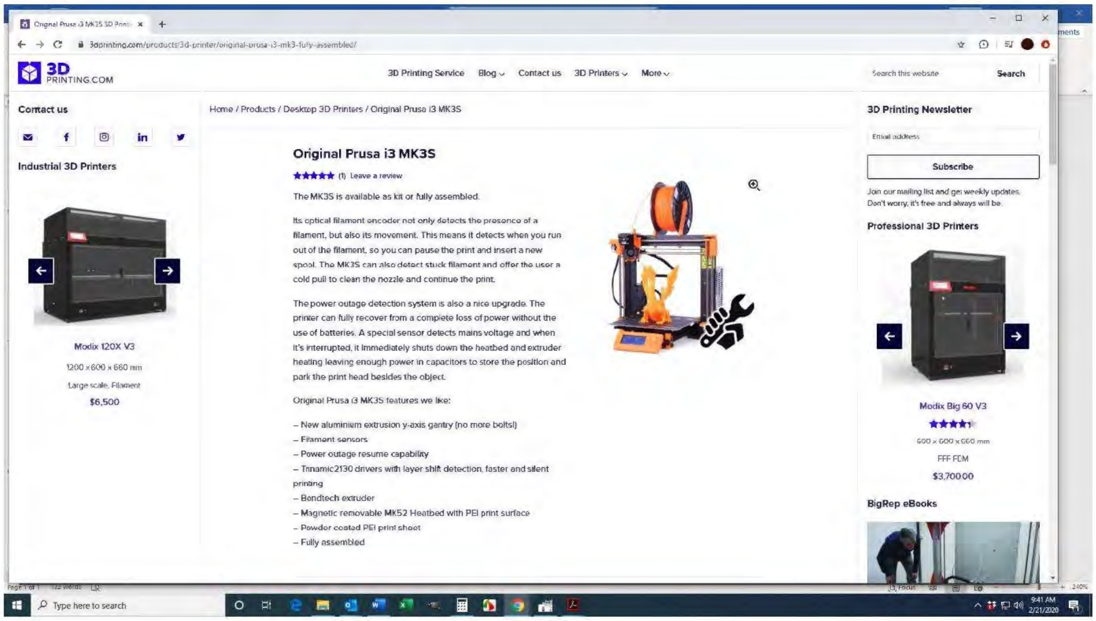
shop.PRUSA3D.com
HARIBO
Goldbären
V3.13
PRUSA RESEARCH S.R.O.
GOO-194


PRUSAMENT
DID YOU KNOW...
PRUSA
POLYMERS
by JOSEF PRUSA
That the manufacturing precision tolerance is below 0.01mm on 98% of the length of every spool we made?
Glitter
PLA
Prusa Galaxy Black
parameters of this spool
1.75 mm ± 0.015 mm
Weight 1063g + spool
Scan me for details
or enter ID c27ffa1 at prusament.com
Nozzle temperature 205 - 220°C
Heatbed temperature 40 - 60°C
SKU: PRM-PLA-GLX-1000
Date: 20.09.2018
Proudly made in Prague
PRUSAMENT
DID YOU KNOW...
PRUSA
POLYMERS
by JOSEF PRUSA
That the manufacturing precision tolerance is below 0.01mm on 98% of the length of every spool we made?
PLA
Azure Blue
parameters of this spool
1.75 mm ± 0.014 mm
Weight 1089g + spool
Scan me for details
or enter ID 334d1b9c at prusament.com
Nozzle temperature 205 - 220°C
Heatbed temperature 40 - 60°C
SKU: PRM-PLA-AZR-1000
Date: 21.09.2018
Proudly made in Prague

Screen captures showing awards and reviews given to Applicant and its products, in support of the acquired distinctiveness of PRUSA under Section 2(f);



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Industrial 3D Printers
Modix 120X V3
1200 x 600 x 660 mm
Large scale, Filament
$6,500
Home / Products / Desktop 3D Printers / Original Prusa i3 MK3S
Original Prusa i3 MK3S
(1) Leave a review
The MK3S is available as kit or fully assembled.
Its optical filament encoder not only detects the presence of a filament, but also its movement. This means it detects when you run out of the filament, so you can pause the print and insert a new spool. The MK3S can also detect stuck filament and offer the user a cold pull to clean the nozzle and continue the print.
The power outage detection system is also a nice upgrade. The printer can fully recover from a complete loss of power without the use of batteries. A special sensor detects mains voltage and when it's interrupted, it immediately shuts down the heatbed and extruder heating leaving enough power in capacitors to store the position and park the print head besides the object.
Original Prusa i3 MK3S features we like:
– New aluminium extrusion y-axis gantry (no more bolts!)
– Filament sensors
– Power outage resume capability
– Trinamic2130 drivers with layer shift detection, faster and silent printing
– Bondtech extruder
– Magnetic removable MK52 Heatbed with PEI print surface
– Powder coated PEI print sheet
– Fully assembled
3D Printing Newsletter
Subscribe
Join our mailing list and get weekly updates. Don't worry, it's free and always will be.
Professional 3D Printers
Modix Big 60 V3
FFF FDM
$3,700.00
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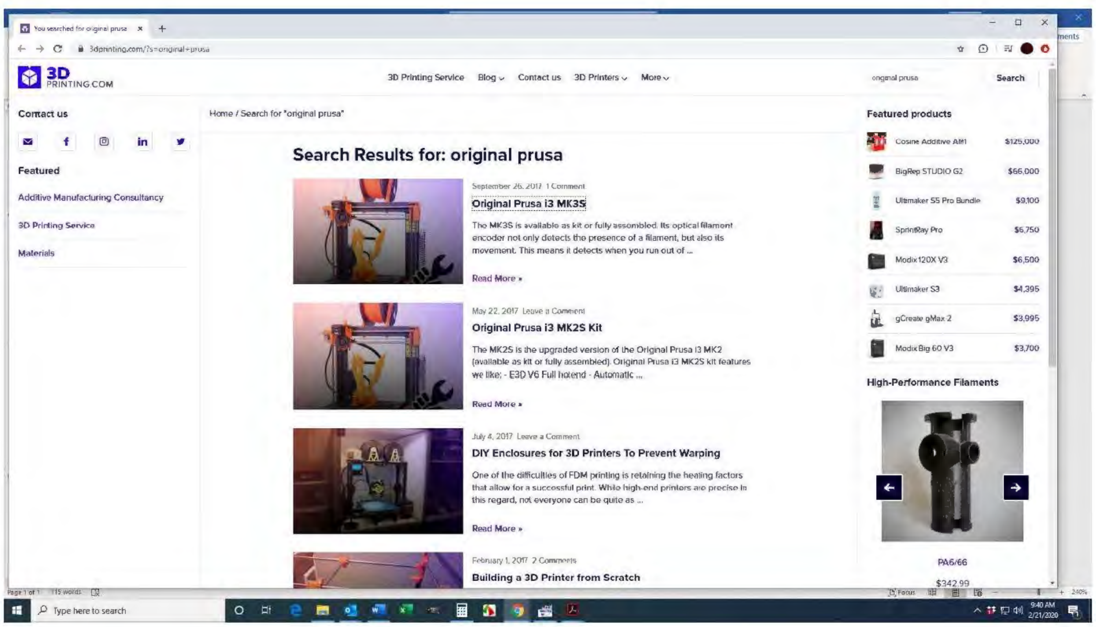
9:41 AM
2/21/2020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3D Printing Service
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September 26, 2017 1 Comment
Original Prusa i3 MK3S
The MK3S is available as kit or fully assembled. Its optical filament encoder not only detects the presence of a filament, but also its movement. This means it detects when you run out of ...
Read More »
May 22, 2017 Leave a Comment
Original Prusa i3 MK2S Kit
The MK2S is the upgraded version of the Original Prusa i3 MK2 (available as kit or fully assembled). Original Prusa i3 MK2S kit features we like: - E3D V6 Full hotend - Automatic ...
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July 4, 2017 Leave a Comment
DIY Enclosures for 3D Printers To Prevent Warping
One of the difficulties of FDM printing is retaining the heating factors that allow for a successful print. While high-end printers are precise in this regard, not everyone can be quite as ...
Read More »
February 1, 2017 2 Comments
Building a 3D Printer from Scratch
Featured products
Cosine Additive AM1 $129,000
BigRep STUDIO G2 $66,000
Ultimaker S5 Pro Bundle $9,100
SprintRay Pro $6,750
Modix 120X V3 $6,500
Ultimaker S3 $4,395
gCreate gMax 2 $3,995
Modix Big 60 V3 $3,700
High-Performance Filaments
PA6/66
$342.99
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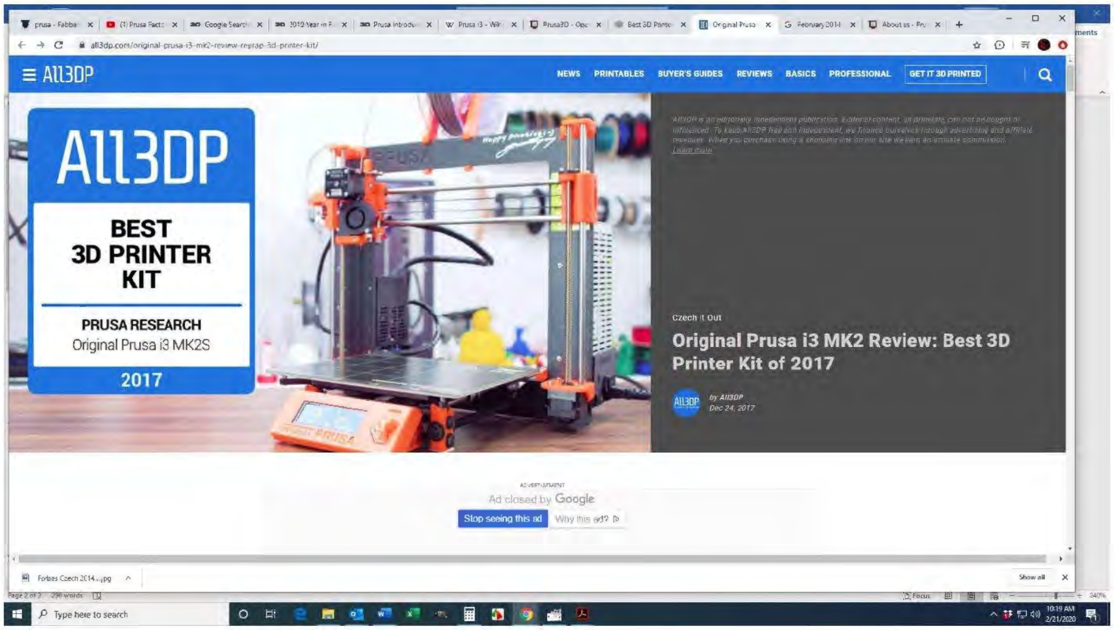

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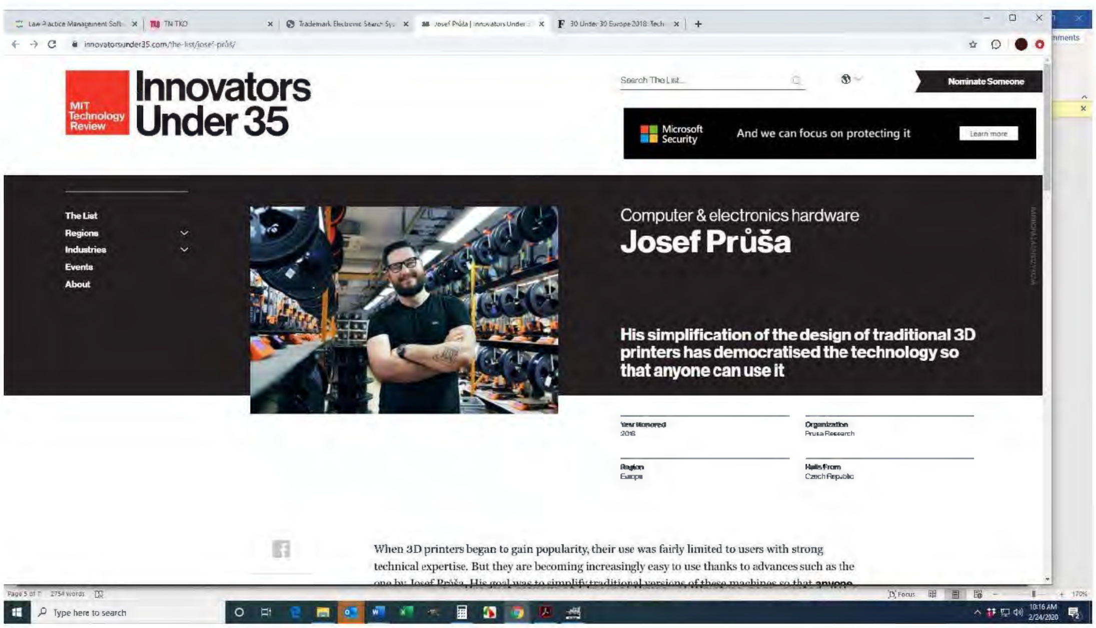

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Josef Průša
His simplification of the design of traditional 3D printers has democratised the technology so that anyone can use it
Year Honored
2018
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Prusa Research
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Hails From
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When 3D printers began to gain popularity, their use was fairly limited to users with strong technical expertise. But they are becoming increasingly easy to use thanks to advances such as the
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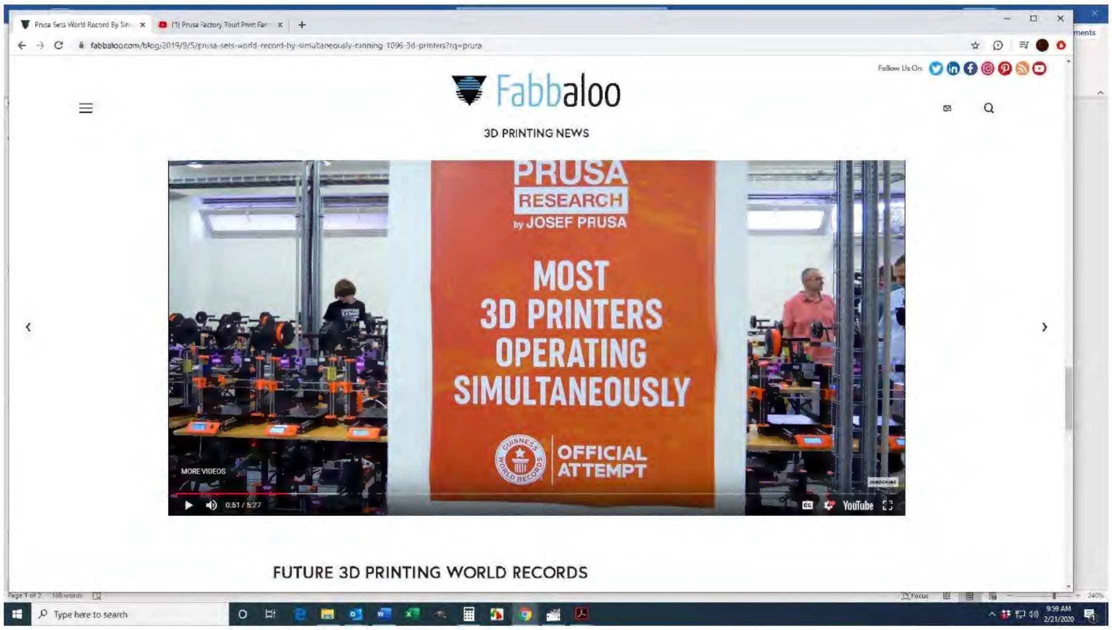
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Prusa Research is one of the most interesting companies in the 3D print space, although they currently deliver only desktop 3D printers.
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There are several ways to perform multi-material 3D printing using filaments. What are the advantages and disadvantages of each?
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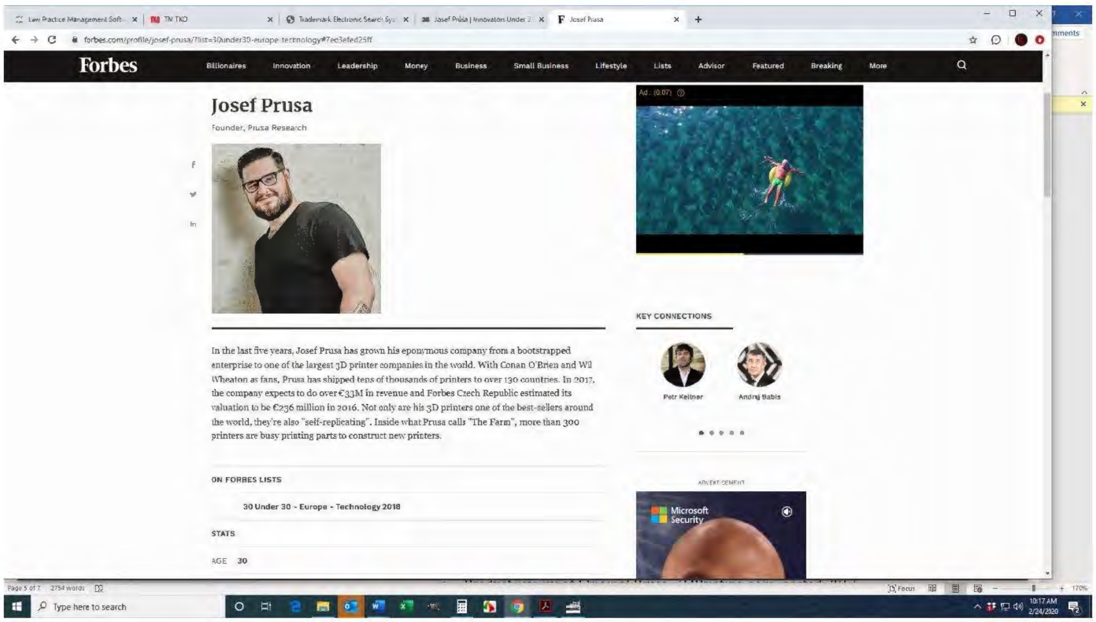
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Josef Prusa
Founder, Prusa Research
In the last five years, Josef Prusa has grown his eponymous company from a bootstrapped enterprise to one of the largest 3D printer companies in the world. With Conan O'Brien and Wil Wheaton as fans, Prusa has shipped tens of thousands of printers to over 130 countries. In 2017, the company expects to do over €33M in revenue and Forbes Czech Republic estimated its valuation to be €236 million in 2016. Not only are his 3D printers one of the best-sellers around the world, they're also "self-replicating". Inside what Prusa calls "The Farm", more than 300 printers are busy printing parts to construct new printers.
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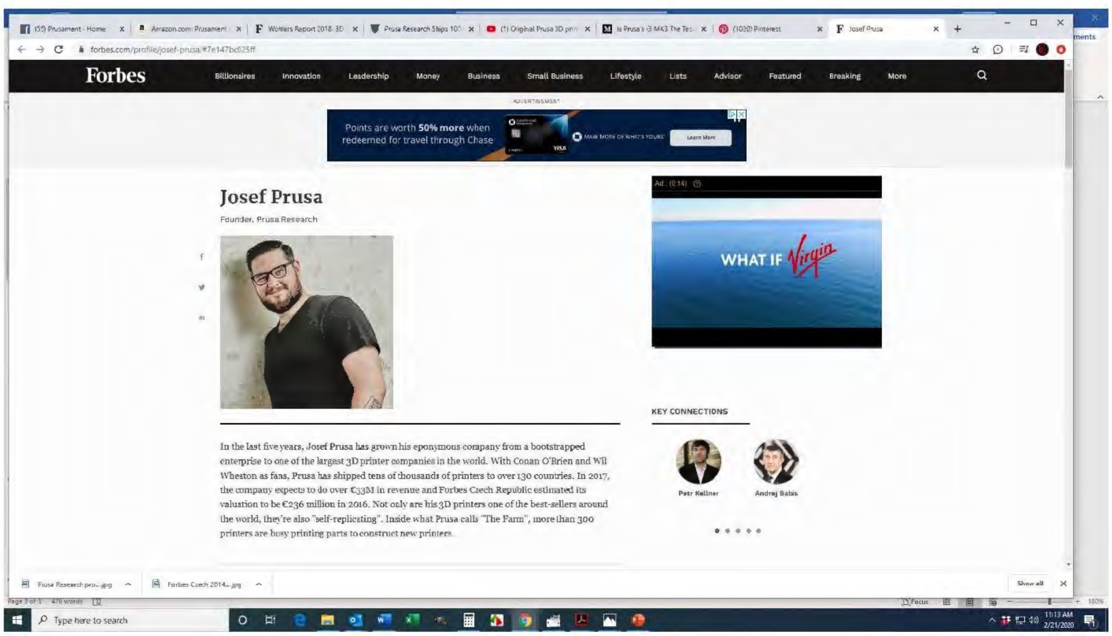
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Points are worth 50% more when redeemed for travel through Chase
Josef Prusa
Founder, Prusa Research
WHAT IF Virgin
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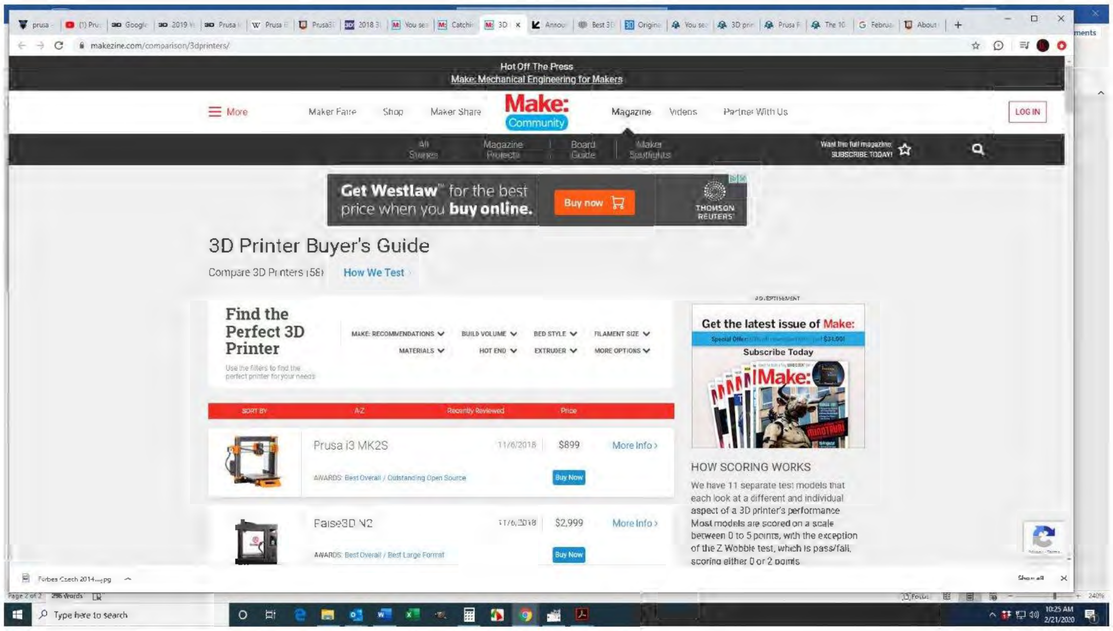
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HOW SCORING WORKS
We have 11 separate test models that each look at a different and individual aspect of a 3D printer's performance. Most models are scored on a scale between 0 to 5 points, with the exception of the Z Wobble test, which is pass/fail, scoring either 0 or 2 points.
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Consumer Electronics Show

CES (formerly an acronym for **Consumer Electronics Show**[1]) is an annual trade show organized by the Consumer Technology Association (CTA). Held in January at the Las Vegas Convention Center in Las Vegas, Nevada, United States, the event typically hosts presentations of new products and technologies in the consumer electronics industry.

CES

Attendees at CES 2016

Status	Active
Genre	Consumer electronics
Venue	Las Vegas Convention Center
Location(s)	Las Vegas, Nevada, U.S.
Country	United States
Inaugurated	June 24, 1967
Most recent	January 7, 2020
Attendance	182,000
Organized by	Consumer Technology Association
Website	ces.tech (http://ces.tech)

Contents

History

The first CES was held in June 1967 in New York City. It was a spinoff from the Chicago Music Show, which, until then, had served as the main event for exhibiting consumer electronics. The event had 17,500 attenders and over 100 exhibitors; the kickoff speaker was Motorola chairman Bob Galvin.[2] From 1978 to 1994, CES was held twice each year: once in January in Las Vegas known for *Winter Consumer Electronics Show (WCES)* and once in June in Chicago, known as *Summer Consumer Electronics Show (SCES)*.

CES Sign

The winter show was successfully held in Las Vegas in 1995 as planned.[3] However, since the summer Chicago shows were beginning to lose popularity, the organizers decided to experiment by having the show travel around to different cities starting in 1995 with a planned show in Philadelphia at the Pennsylvania Convention Center. However, the inaugural E3 gaming show was scheduled to be held on the West Coast in May and proved a source of increasing competition, causing the Philadelphia Summer CES show to be cancelled.[4] The 1996 Winter show was again held in Las Vegas in January,[5][6] followed by a Summer show this time in Orlando, Florida, however only a fraction of the traditional exhibitors participated.[6] Again, the 1997 Winter show in Las Vegas was very successful. The next "Summer" show was scheduled to be held in conjunction with Spring COMDEX in Atlanta, however when only two dozen-or-so exhibitors signed on, the CES portion of the show was cancelled.

In 1998, the show changed to a once-a-year format with Las Vegas as the location. In Las Vegas, the show is one of the largest (the other being CONEXPO-CON/AGG), taking up to 18 days to set up, run and break down.[7]

Show highlights

1960s

1967

The first CES was held in New York City from June 24 to 28, 1967. The 200 exhibitors attracted 17,500 attendees to the Hilton and Americana hotels over those four days. On view: the latest pocket radios and TVs with integrated circuits.[8]

1970s

1970

Philips unveiled the first-ever home VCR, the N1500 videocassette recorder. Until that point, VCRs cost upward of $50,000 and were used mainly by TV stations, but the Philips model with a built-in tuner was just $900.[9]

1976

Winter CES held January 7–9 in Chicago, at the Conrad Hilton Hotel. Per the show guide, it included video (with television receivers and video systems panels), audio (including CB radio, radio, audio compacts, audio components, and tape equipment panels), and calculator and watch areas, considered separate component conferences. Speakers included the FTC's Joan Bernstein on "The Warranty Law -- Its Status and Impact," and the FCC's Richard M. Smith on "Regulating Citizens' Band Radios."

Summer CES held June 13–16 also in Chicago, at McCormick Place.

1979

Winter CES held January in Las Vegas. Atari 400 and 800 computers introduced.

Summer CES held June 3–6 in Chicago, at McCormick Place. Features (per the show guide) included personal communications, retail advertising, promotion and store layout, exports, video, audio, auto sound/telephone sales, and a large series of retail sales and sales management breakouts.

1980s

1982

Summer CES June 6 at Chicago saw the first appearance of Commodore 64 and General Consumer Electronics' (GCE) Vectrex.[10]

1990s

1993

In a one-time experiment, the Summer CES 1993 was open to the general public.[11]

Major announcements during this edition were:

- Capcom unveils Mega Man X for the first time in North America.[12][13][14][15]

2000s

2002

Microsoft demonstrated a preview version of Windows XP Media Center Edition at CES 2002.[16]

2004

The Blu-ray Group held at the January 2004 CES the first US press conference to promote the Blu-ray Disc format.[17]

2005

The 2005 CES was from January 6 to 9, 2005, in Las Vegas, Nevada, at the Las Vegas Convention Center. The event started off with a twist when the main keynote address by Microsoft chairman Bill Gates went wrong, as his demonstration of Windows Media Center resulted in a Blue Screen of Death,[18] much to the amusement of the onlookers. Samsung showed off a 102-inch (2.6 m) plasma television.[19]

Zimiti Ltd (renamed Boardbug Ltd in 2007) won the "Best of Innovators"[20] award for Personal Electronics. It is the only British company to have won this award.

2006

The 2006 exhibition took place on January 5–8, 2006, at the Las Vegas Convention Center, the Sands Convention Center, the Alexis Park hotel and the Las Vegas Hilton hotel. HDTV was a central theme in the Bill Gates keynote[21] as well as many of the other manufacturer's speeches. The standards competition between HD DVD and Blu-ray Disc was conspicuous, with some of the first HD movie releases[22] and first HD players being announced at the show. Philips showed a rollable display prototype whose screen can retain an image for several months without electricity (http://www.anandtech.com/tradeshows/showdoc.aspx?i=2665&p=20). Hillcrest Labs won the "Best Of Innovations" award in the video accessories category for software and hardware that allows a television to be controlled with natural gestures.[23][24] Attendance was over 150,000 individuals in 1.67 million net square feet of space, making it the largest electronics event in the United States.

2007

In a break from recent tradition, the 2007 CES exhibition did not begin on a Thursday, nor span a weekend. It ran from Monday to Thursday on January 8–11, 2007. The venues also changed slightly, with the high-performance audio and home theater expo moving from the Alexis Park venue to The Venetian. The remaining venues were the same as previous years: the Las Vegas Convention Center was the center of events, with the adjacent Las Vegas Hilton, and the Sands Expo and Convention Center hosting satellite exhibitions.

The location for the main keynotes was the other major change for 2007. Previously held at the Las Vegas Hilton's Main Theater, they staged for the first time at The Palazzo Ballroom in The Venetian. Bill Gates gave his ninth pre-show keynote address on the Sunday evening. The opening keynote was presented by Gary Shapiro (President/CEO of the Consumer Electronics Association, which hosts the event), with Ed Zander, Chairman/CEO of Motorola. Other keynote speakers scheduled included Robert Iger from The Walt Disney Company, Michael Dell, founder of Dell Inc., and Leslie Moonves of CBS.

Finally, Industry Insider presentations moved to the Las Vegas Hilton, with contributions from Olli-Pekka Kallasvuo, CEO of Nokia and John Chambers, CEO of Cisco.

In the gaming section for Windows Vista and DirectX 10, there were two games shown: *Age of Conan* and *Crysis*.

2008

The 2008 exhibition was from January 7 to 10, 2008, in Las Vegas with 141,150 attendees. Bill Gates gave the keynote speech, in which he formally announced his retirement from his day-to-day duties at Microsoft. Along with the announcement, he presented a lengthy comedy skit on what his last day with Microsoft would be like, complete with cameos from celebrities including Jay-Z, Steven Spielberg, Barack Obama, Hillary Clinton and many others.[25]

Panasonic attracted much attention by releasing a 150" Plasma TV, as well as a 50" TV as thin as 0.46 in. (11.6 mm).

2009

The 2009 exhibition, held January 7–10, 2009, returned to the previous Thursday–Sunday schedule, and attracted 113,085 attendees. Among more than 2,700 exhibiting companies were approximately 300 first-time exhibitors.

Several highlights include organic light-emitting diode (OLED) televisions,[26][27][28] the Palm Pre,[29][30] Mattel MindFlex Game,[31] pico projectors,[32][33][34][35] the Marvell SheevaPlug plug computer,[36] and 3D projectors.[37][38][39]

The Minoru 3D Webcam, a USB webcam that is billed as the world's first stereoscopic 3D consumer stereo webcam won the "Fans Favorite" award.[40] Dell introduced its Dell Adamo subnotebook.[41]

The game show *Jeopardy!* filmed one episode from the celebrity series and the 2009 Tournament of Champions on a new set at the Sony booth. The set was moved to their main studio at Sony Pictures Studios in Culver City, California, starting with the show's 26th season through the 29th season.

CES 2009 suffered 22 percent or more attendance drop, which was attributed to the global financial crisis.[42]

2010s

2010

The 2010 exhibition was held January 7–10, 2010, and attracted more than 120,000 attendees.[43]

Attendees walking by the LG Electronics display at CES 2010

Highlights include the Intel Infoscape, which is run on the Intel Core i7 processor. One computer ran two 7-foot (2.1 m) screens, displaying 576 cubes hooked up to 20,000 info sources, including 20 live video feeds. Visitors would touch one of the cubes, and an infobox displaying that content would come forward. One journalist explained, "The graphics on the giant screens were a tons of fun to move around with their uncanny quickness and smooth motion, and the whole thing felt super responsive, Giving us a peek into the future, it seemed a lot like that computer screen in the movie Minority Report. It was the most spectacular demo we saw at CES 2010."[44][45] Equally impressive, Parrot presented the 1st prototype of Parrot AR.Drone, a remote-controlled flying toy which streams video via WiFi to an iPhone.

Sustainable Planet grew by 40% in 2010.[46]

2011

The 2011 exhibition was held from January 6 to 9, 2011.[47] CESWEB is reporting that their pre-audit numbers show an attendance of 128,949.

Many tablets were introduced in 2011's show, such as the Motorola Xoom tablet, winning Best of Show,[48] which runs Android Honeycomb. Many 4G phones were also unveiled at the show, including the LG Revolution, Samsung Infuse 4G, HTC Thunderbolt, Sony Ericsson Xperia Arc, Motorola CLIQ 2, Motorola Droid Bionic, and Motorola Atrix 4G. In a push towards mobile devices, Microsoft demonstrated an early version of the next release of the Windows operating system, running on ARM-based devices.[49]

3D TVs were introduced by many giants, such as Mitsubishi's 92-inch model of its 2011 lineup of theater-sized 3D Home Cinema TVs.[50] Toshiba also unveiled its Glasses Free 4K 3D TV prototype.[51] Samsung announced the Plasma 3D HD TV series named D8000[52] and LG introduced the LED 3D TV of its Infinia Nano series.[53]

3net, a 3DTV channel co-owned by Discovery Communications, Sony, and IMAX, was previewed.[54]

2012

The 2012 exhibition was held from January 8 to 13, 2012. Microsoft released an official statement saying that CES 2012 will be Microsoft's last appearance at the event.[55][56] The show organizers claimed that 153,000 people attended the 2012 show, a 2% increase from the previous year and a new all-time attendance record.[57] Intel was caught falsifying a demo of their new Ivy Bridge processors.[58] AMD demonstrated their new Trinity APUs.[59]

AMTC was demonstrating this 'Tier-2' CE products ('middleware') featuring the Inview Technology platform. Inview claimed that its low processing and memory footprint means connected TV capabilities are available at low-cost, as the software is provided royalty free. Parrot presented the "world's most advanced headphones" the Parrot ZIK By Starck.[60]

This was also the first year in which the Photo Marketing Association held its annual trade show in conjunction with CES, with the PMA show branded as PMA@CES.

2013

The 2013 International CES, instead of starting on Thursday went from Tuesday to Friday, January 8–11, 2013, in the Las Vegas Convention Center, Las Vegas, Nevada, United States.[61] Over 3,000 exhibitors showcased a wide range of innovative products this year. CES 2013 was known for what was billed as an insane opening by Qualcomm. This year the categories include 3D, Accessories, Audio, Automotive Electronics, Embedded Technology, Lifestyle Electronics, Wireless & Wireless Devices to name a few.[62] 2013 International CES however was not necessarily being noted for announcing the newest products, but getting a lot of press for the fundamental changes about to hit the digital world; such as motion detection sensors, the driverless cars and digital home safety and technology.[63]

Major announcements during this edition were:

- Samsung unveils multi-view TVs and Flexible OLED Display Youm[64][65]
- Sony announced Sony Xperia Z smartphone, and Samsung Announced Galaxy S2 plus smartphone.
- Sony announces TRILUMINOS (https://www.sony.co.uk/electronics/4k-hd-triluminos-display-colour-tvs/) quantum dot display technology.
- Qualcomm unveils Snapdragon 600 & 800 processors that can bring 4K recording capability in Mobile Phones[66]
- Intel reveals ATOM processor for embedded markets as well as Bay Trail[67]
- Panasonic announces a wide range of smart TVs. The Panasonic's Smart Viera HDTVs lineup includes 16 plasmas and 16 LEDs.[68]
- Razer announces Razer Edge tablet PC[69]
- Nvidia announces Android handheld Project Shield[70]
- Research In Motion shows off Blackberry 10 touch screen phone[71]

2014

The 2014 International CES was held during the week from January 7 to 10, 2014, in the Las Vegas Convention Center, Las Vegas, Nevada, United States.[72] The first Li-Fi smartphone prototype was presented at the show. The smartphone uses SunPartner's Wysips CONNECT, a technique that converts light waves into usable energy, making the phone capable of receiving and decoding signals without drawing on its battery.[73] The phone also has a transparent photovoltaic screen that lets light recharge the phone.[74]

LG debuted its webOS on smartTVs and new 77-inch curved OLED Ultra HD TV.[75] Samsung unveiled its curved TVs with two series of concave TVs.[76]

ProtectCELL showcased its comprehensive mobile protection plans for all major devices, including the iPhone 5S and 5C, iPad Air, iPad Mini 2 and Galaxy S4. With demonstrations such as blending a Blackberry, ProtectCELL proves they will cover all damages.[77]

The AMD presentation mentioned (among others) – the Kaveri CPU of the Steamroller architecture, Heterogenous System Architecture (HSA) lineup and the intention to build upon that, immersive experience, Mantle and AMD TrueAudio.[78]

In the Intel keynote presentation, its CEO talked about three areas in which technology can improve: living, working, and playing. He also presented Intel Edison, a SoC of the SD card format.[79]

Pebble announced the Pebble Steel smartwatch, which has a thin body, tactile metal buttons, and Corning Gorilla Glass.

Laser diodes were unveiled at the show that are going to be used for high-beam headlights in Audi vehicles. The high beams will be lasers, though the low beams will be light-emitting diodes. The car maker says that their high beams have a 500-meter range, which is roughly twice the distance of LED high beams. Lasers are expensive though. Lasers are smaller, brighter and more energy efficient than LED headlamps. Their laser headlamps use less than half the energy of LEDs. Laser diodes can emit 170 lumens per watt, while LEDs generate only 100 lumens. Lasers are sensitive to heat but that has not stopped their production for vehicles. Laser technology is not as advanced compared with LEDs, which have been around for decades.[80]

2015

The 2015 International CES was held during the week January 6–9, 2015, in the Las Vegas Convention Center, Las Vegas, Nevada, United States. The 2015 CES was reportedly the largest in its history, with 3,600 exhibitors and 170,000 professional/industry attendees.[81]

2016

The 2016 CES was held January 6–9, 2016, in Las Vegas and 3,600 companies attended; the CES 2016 venues of the Las Vegas Convention Center, the Westgate Las Vegas Resort & Casino and the Sands Expo & Convention Center had over 2.4 million square feet utilized for the event. The 2016 event had notably more security with full bag searches and police officers in armored gear and explosives detection dogs.[82]

In 2016, there were only 22 CES Innovation Awards Honorees in the Tech for a Better World category. These included Advanced Ordnance Teaching, Clinical Bidet, Ossia's Cota Wireless Power Technology,[83] eFit, eGeeTouch Smart Fingerprint-NFC Luggage Lock, Eye Tribe Tracker Pro, homnistat, Hydrao, Jacoti Hearing Suite, K-1 Assistive Device, Luminon, MATRIX, Netatmo Presence, Noke U Locke, Owlet Baby Monitor, PanaCast 2, RemoPill, SCiO, Smart Air Purifier, The New Kano, Whirlpool Smart Top Load, and ZPower.[84]

One of the most anticipated technologies at 2016 CES was experiencing consumer device charging without wires—or "wireless power" --, as shown by companies like Energous, Ossia, and WiTricity.[85]

2017

CES 2017 was held January 5–8, 2017, in Las Vegas.[86] Even with tight security at the show, two prototype Razer triple-screen gaming laptops were stolen during the show. Min-Liang Tan, co-founder and chief executive officer of Razer, said that the company is treating the case as "industrial espionage". A Razer spokesperson said they were offering $25,000 for any "original information leading to the identification, arrest and conviction" of anyone who was involved with the crime.[87]

2018

CES 2018 was held January 9–12, 2018, in Las Vegas, Nevada, United States. Many companies such as Amazon, Nvidia, and Google had a presence at the event.[88]

The newest model of Sony's Aibo companion robot was featured here, and was noticed as one of the standout items of 2018.

In this year, there were 31 CES Innovation Award categories. CES Best of Innovation Award Honorees included Siren Diabetic Socks, 2018 Nissan Leaf, Samsung's first consumer Micro LED TV, Wi-Charge's Long-Range Wireless Power Technology,[89] Intel Movidius Neural Compute Stick, 3D Touch Surface Display by Continental Automotive Systems, Aipoly Autonomous Store Platform, AMD Ryzen Threadripper 1950X, Amaryllo's AR4, A.I. security camera, IRIVER media player, Bang & Olufsen's BeoSound Shape, BUDDY robot by Blue Frog Robotics, HP's 3D Camera, Dell Ocean-Bound Plastics Packaging Program, ElliQ by Intuition Robotics, Ethereal Halo by Ethereal Machines, InstruMMents 01 world's first Dimensioning Instrument, Kensington VeriMark Fingerprint Key, Lancey smart space heater, LG 4K UHD Projector, Light L16 multi-aperture camera, Looxid VR, MARS smart TWS earbuds, Sproutel's social robot, Nura headphones, NUVIZ Head-Up Display for motorcyclists, Samsung Family Hub 3.0 Refrigerator, Trident 3 Arctic gaming console, Dynamic's WalletCard, WHILL Model Ci and Willow Wearable Breast Pump.

In a way of celebrating CES 2018, a Las Vegas strip club even decided to introduce the public to their creations, which were the world's first ever robot strippers.[90]

Companies offering wireless charging solutions were popular at CES 2018. Many vendors had shown off contact-based charging pads. Others demonstrated products delivering power at a distance. Some vendors exhibited near-field products (Energous, Powercast) and mid-field products (Ossia, uBeam). Wi-Charge has demonstrated first far-field charging product.[91]

2019

CES 2019 was held on January 8–11, 2019 in Las Vegas, Nevada with 182K+ total attendants and 4.4K+ companies exhibited. John Deere had a presence at the event[92] while Mercedes Benz debuted the second-generation CLA Class at the show.[93] Hikvision and IFlytek, two companies later sanctioned by the U.S. government for allegedly enabling human rights abuses in Xinjiang with their technology, were also present.[94]

- News Conference (Media Only) — January 6–9
- Keynotes & Conference Program at Tech East, Tech West and Tech South — January 7–11
- Exhibitors at Tech East and Tech West — January 8–11
- C Space Conference Program & Exhibits at ARLA — January 7–10

Honda introduced the Autonomous Work Vehicle and P.A.T.H. (Predicting Action of The Human) Bot at the show.[95] Russia's search giant Yandex announced that they had been offering free driverless rides as a demo of their autonomous Yandex taxi service.[96] There are 30 CES Innovation Award categories. CES Best of Innovation Honorees include the KitchenAid Cook Processor Connect, LG V40 ThinQ, Zumi RoboCar, Ring Spotlight Cam, Samsung 2019 Family Hub, and the 2018 Nissan Leaf for the second time in a row.[97] Google had set up its Google Assistant-themed ride at their booth.[98]

CES revoked an innovations award presented to Lora DiCarlo, stating that products that are “immoral, obscene, indecent, profane or not in keeping with CTA’s image will be disqualified.”[99]. The award was later reinstated.[100]

2020s

2020

The 53rd CES was held in Las Vegas from 7 January to 10 January 2020.[101] Apple Inc. attended its first CES since 1992.[101][102]

Automotive has become a major part of CES with focus on innovation in electric vehicles, infotainment, telematics, autonomous capabilities and ride sharing. Even major OEMs are now using CES to introduce new automotive technologies to the public the first time. Suppliers to the automotive industry involving electronics are increasingly present at the CES. At the CES 2020 it was particularly noticeable that a large number of vendors in autonomous (self driving) technology were present. Mercedes showcased their Vision AVTR concept car of the future inspired by the movie Avatar.[4] (https://www.cnet.com/roadshow/news/mercedes-benz-avatar-concept-james-cameron-ces-2020/) Sony was possibly the biggest surprise at CES 2020 with their electric vehicle concept incorporating Sony technologies for sensors and infotainment.[5] (https://www.theverge.com/2020/1/8/21056404/sony-vision-s-electric-concept-prototype-first-look-ces-2020) A range of the electric vehicles shown at CES 2020 are expected to enter production in the next 1-2 years from the established OEMs as well as startups such as Rivian, BYTON, Faraday Future and others.[6] (https://www.cnet.com/roadshow/news/best-new-car-tech-ces-2020/).

Hyundai and Uber announced a joint-initiative at CES 2020 to develop a 100% electrically-powered flying taxi that will feature vertical take off/landing and a four-passenger capacity at 180 mph. The partnership marks the first for the Uber Elevate (https://www.uber.com/us/en/elevate/) initiative for aerial ridesharing[103].

CES received major backlash in response to keynote speaker Ivanka Trump, sparking #BoycottCES on Twitter[104].

CES Asia

The CES has spawned its Asian sibling, **CES Asia** which happens annually during June in Shanghai:

- 2019: The CES Asia 2019 took place from 2019-06-11 to 2019-06-13.
- 2020: The CES Asia 2020 will take place from 2020-06-10 to 2020-06-12.

Its official homepage is located at

- http://www.cesasia.cn

See also

- IFA (Berlin, Germany)
- CeBIT (Hannover, Germany)
- Computex (Taipei, Taiwan)
- Mobile World Congress (Barcelona, Spain)
- GITEX (Dubai, UAE)

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External links

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- {ces 2020|https://www.technicalsaad.com/2020/01/ces-2020-year-that-households.html}}

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This page was last edited on 17 February 2020, at 13:38 (UTC).

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3D PRINTING NEWS

27 Jan 2017

Things Looking Good For Prusa Research

Kerry Stevenson (/blog?author=509c2c3ae4b01d08db3d981f)

Fabbaloo Visiting with Josef Prusa

3D PRINTING NEWS

After the "consumer crash" of desktop 3D printing there remains the surviving companies. One that's far beyond mere "surviving" is Prusa Research.

The Czech-based company was founded by Josef Prusa, who is notable for designing the open source Prusa 3D printer that has proven very popular in the RepRap community. Not only have countless hobbyists successfully built their own desktop 3D printer using the Prusa design, but several companies manufacture and market 3D printers using the very same design.

One of those companies just happens to be Prusa Research itself, which is no doubt the biggest manufacturer of Prusa-style 3D printers in the world today. If you're going to buy a Prusa machine, why not buy it from the company that invented it?

The machine design was and remains open source, and that philosophy carries through to Prusa Research's approach to business. While the machine design has undergone several improvement iterations, you can still upgrade the original machine to the current level. I expect this capability to continue until Prusa develops an entirely different machine. This makes a purchase of a Prusa a way to keep up to date on the latest features, like an optional subscription, rather than getting locked into a particular machine and requiring a full replacement later.

It's important to the industry that Prusa does this, because in a sense, Prusa and the other leading survivors are providing a way to "recover" the reputation of inexpensive desktop 3D printers in the eye of the public. They're doing so by providing a quality machine with excellent quality prints as well as being very reliable.

In fact, the Prusa i3 models have proven so reliable and high quality that they're consistently ranked at or near the top of every evaluation list I've seen. This alone provides more than sufficient marketing for Prusa Research.

Josef Prusa explained to us that their company now employs 90 people, with about 30 "core" people and the remainder preparing products. The self-financed company has no investors to answer to and thus can grow at its own pace, which seems to be quite rapid.

How successful is their business? It seems incredible, but Prusa told us they are now shipping 3,000 machines per month, an astonishing figure that is likely higher than almost all other 3D printer manufacturers with only a few exceptions.

To put this in perspective, if we assume Prusa's average sale price is their lowest cost model, the unassembled Prusa i3 MK2 kit, at USD$699, it suggests this company has annual revenue of at the very least USD$25M! And it's probably more than that due to a portion of the sales being their assembled USD$899 model and increasing orders.

Their growth has been nothing short of ridiculous. Prusa explained that he expected the number of orders to decrease as the order delay time increased. In fact, he says they've seen exactly the opposite: the longer the lead time, the more orders they receive!

This has meant the company must spend effort to expand their capacity and thus have recently hired no less than 50 people. They're also exploring ways to scale up their production much more.

As for what's next, Prusa hints they've got at least two big product announcements likely to come later this year.

Via Prusa Research (http://www.prusa3d.com/)

corporate (/blog/category/corporate)

prusa (/blog/tag/prusa), @josefprusa (/blog/tag/%40josefprusa)

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3D PRINTING NEWS

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KERRY STEVENSON (/BLOG?AUTHOR=509C2C3AE4B01D08DB3D981F)

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28 Jan 2017 Anyone Can CAD Online With CAD.Ai

(/blog/2017/1/27/anyone-can-cad-online-with-cadai)

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27 Jan 2017 Making Your Own PEEK Filament

(/blog/2017/1/27/making-your-own-peek-filament)

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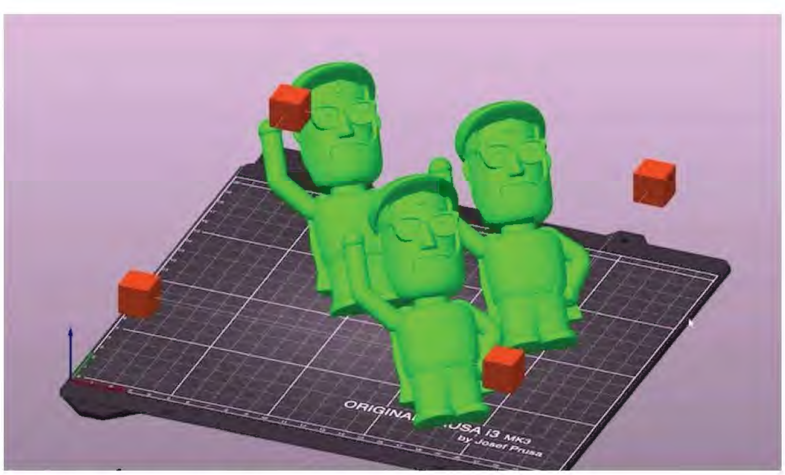
3D PRINTING NEWS

30 May 2019

Prusa Rebrands and Improves Software Systems

Kerry Stevenson (/blog?author=509c2c3ae4b01d08db3d981f)



The plating view from the new PrusaSlicer [Source: Prusa Research]

Prusa Research introduced PrusaSlicer to replace their previous management software.

Previous to the announcement, Prusa Research's main software tool was Slic3r Prusa Edition, sometimes referred to as "Slic3r PE". This was a fork of the open source Slic3r project that Prusa Research has been incrementally developing for some years.

Why do this switch? There seem to be several reasons.

First, the additions performed by Prusa Research to the tool are significant. Prusa Research has no fewer than seven people assigned full-time to work on this software, and could even add more in the future. Their efforts have added so much to the original Slic3r project that it is really quite a different system.

Secondly, the name of the product is quite confusing. People like to shorten lengthy names for ease of speaking, and in this case "Slic3r PE" was often called "Slic3r". But wait, what do you call the original Slic3r? The two were being confused.

Thirdly, the name "Slic3r" has an ambiguous pronunciation. Some say it as "slicer", while others use the absurd "slick-three-arrrr". I welcome the step away from unpronounceable names, and think "PrusaSlicer" is a terrific product name.

Finally, the system now serves as the single receptacle for all slicing functions required by the company. For example, it now includes slicing capabilities for their new SLA 3D printer, the SL1 (https://www.fabbaloo.com/blog/2018/9/24/thoughts-on-prusas-new-sl1-resin-3d-printer), in addition to the traditional plastic extrusion methods.

But it's not just about product names, as the product itself has been dramatically improved with a number of new features.

Prusa Research has done quite a bit of work on the user interface, and specifically has introduced three modes for operation:

- **Simple**: A mode for new users that makes invisible all aspects except for the absolute minimum required to begin 3D printing.
- **Advanced**: A mode where many practical settings are shown for more advanced users. This is where the majority of experienced users will operate.
- **Expert**: A special mode that's used mostly for those attempting to develop settings for brand new machines.

Even better, all settings are color coded for easy identification of how much trouble you could get into by modifying them:

- **Green**: Safe to be tinkered with by a beginner
- **Yellow**: Advanced user may want to modify these parameters
- **Red**: Expert settings, most of which should only be touched if you're making a profile for a new printer

PrusaSlicer 2.0 release!

They've also remade the toolbars to include more easy-to-understand iconography. It seems that the company recognizes their client base includes many people who are new to 3D printing and these changes are certainly directed at them.

There is a new ability to perform changes to the 3D model before printing begins through a new "gizmo", as they call it. It's basically a set of manipulation knobs that appear around the 3D model. You can then resize, move, scale and perform other operations in a far easier manner than using a dialog box as in previous versions.

Support structure generation is obviously still provided, but there are now some interesting ways to tweak the generated supports. Usually when a slicing system creates supports, there are areas where it really should not have made them, as well as areas that require supports where they were not generated. The new PrusaSlicer includes "blockers" and "enforcers" that do exactly that. In other words, you can easily tweak the support generation to arrive at the perfect arrangement.

The company has also discontinued their Prusa Control software tool, as its functionality is now being incorporated into PrusaSlicer. Thus, features such as their layer color change solution, "Color Print", is still available for use.

One new feature I quite appreciate is the automatic calculation of print job estimated time and material use, which was not always visible on prior versions.

There are a number of other new features that will be valuable to 3D printer operators.

I'm quite interested to explore the new version, and I am sure that the very numerous Prusa users worldwide will also be upgrading to PrusaSlicer soon.

Via Prusa Research (https://blog.prusaprinters.org/prusaslicer-2-release/)

3D PRINTING NEWS

Featured

Hold Onto Your PCBs – Autodesk Just Added ECAD To Fusion 360 (/Blog/2020/2 Onto-Your-Pcbs-Autodesk-Just-Added-Ecad-To-Fusion-360)

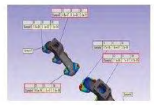
Autodesk has revealed that Fusion 360 now includes ECAD functionality.

Feb 13, 2020

The Dawn Of Dual-Screen For 3D CAD Apps… Is Upon Us (/Blog/2020/1, Dawn-Of-Dual-Screen-For-3d-Cad-Apps-Is-Upon-Us)

You would think this article is from a decade or two ago, but no. It's really about dual-screen and CAD software using dual-screens… but not like you're used to.

Jan 30, 2020



A Smarter Way To Look At Simulation Results? (/Blog/2020/1, Smarter-Way-To-Look-At-Simulation-Results)

The company's main product is VCollab, a solution created to make the results of engineering simulation more easily shared and understood.

Jan 17, 2020

Autodesk Fusion 360 (Sub) Now Includes EAGLE PCB Design (/Blog/2020/1, Fusion-360-Sub-Now-Includes-Eagle-Pcb-Design)

If you're a user of Fusion 360, your subscription now includes access to Autodesk EAGLE, the electronic design automation software to aid schematic layout or determine PCB routing and component placement.

Jan 16, 2020

Awaiting Simplify3D 5.0 (/Blog/2020/' Simplify3d-50)

Simplify3D says they will issue the long-awaited version 5 of their powerful slicing software in 2020. It's now 2020, and what can we expect?

Jan 13, 2020

software (/blog/category/software)

prusa (/blog/tag/prusa), slic3r (/blog/tag/slic3r), slicing (/blog/tag/slicing), color (/blog/tag/color), open source (/blog/tag/open+source)

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3D PRINTING NEWS

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30 May 2019 Interactive Map Of 3D Printing Tech Available

(/blog/2019/5/30/interactive-map-of-3d-printing-tech-available)

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30 May 2019 How They Made It: The Indestructible 3D Printed Guitar

(/blog/2019/5/30/how-they-made-it-the-indestructible-3d-printed-guitar)

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3D PRINTING NEWS

14 Aug 2019

ASA 3D Printer Filament For The Masses

Kerry Stevenson (/blog?author=509c2c3ae4b01d08db3d981f)

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3D PRINTING NEWS

Orange ASA 3D printer material from Prusament line [Source: Prusa Research]

Prusa Research has released a new line of 3D printer filaments made from ASA (https://fabbaloo.com/blog/2019/8/14/asa-3d-printer-filament-for-the-masses), and I think this could be a turning point.

ASA FILAMENT FOR 3D PRINTERS

Czechia-based Prusa Research has been producing their own 3D printer filament — Prusament (https://www.fabbaloo.com/blog/2018/9/25/prusament) — for a year now, and it's been very well received. Like many innovations in 3D printing, they were not satisfied with the quality and consistency they were receiving from other vendors and decided they should try to do it better themselves.

Their operation has a strong focus on quality, as do other leading producers of filament for 3D printers. However, there's a difference with Prusa Research's approach: they publish the quality report for each individual spool they sell! Each spool has a QR code that links to their factory database where they track the diameter of each cm of the spool as it is produced.

In this way they ensure the entire spool is within the tolerance levels stated. That tolerance is 0.02mm variance in the diameter of the 1.75mm filament. This itself is notable, as most other producers state "only" 0.05mm tolerance. But importantly, other vendors simply publish the number, but do not provide any quality data on individual spools.

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3D PRINTING NEWS

PRUSAMENT SUCCESS

This attention to detail paid off handsomely for Prusa Research, who quickly realized they could not keep up with demand. After their first production line installation, they had to add multiple additional lines, making them one of the larger producers of 3D printer filament worldwide. I'm not sure how many lines they have now, but more than likely they are adding more as we speak.

However, the only materials they produced were PLA and PETG, the most basic of 3D printer materials. ABS was mysteriously absent from their product shelves. Now, that's changed.

They've introduced a new material, ASA.

ASA is probably not something most 3D printer operators are familiar with, although it's gained quite a bit of popularity with the more technically proficient users.

It's a material that is somewhat comparable to ABS, as it has similar properties, but it is better to use.

ASA PROPERTIES

The major challenge with ABS is that is can easily warp due to thermal differences. For that reason many 3D printer operators prefer to use PLA, which is a lot easier to print, unless there is a specific engineering reason to do so.

But there's another negative property of ABS that fewer are aware of: it is susceptible to UV light. That is, if a print is exposed for some time outside where the sun's UV rays can strike it, the object will degrade, crack, discolor and ultimately fail.

The good news is that ASA does not degrade when exposed to UV light. Objects printed in it are perfectly suited for any outdoor application.

The even better news is that ASA, while carrying many of ABS' good qualities, is also a bit easier to print than ABS. It doesn't warp quite as much, although more than PLA. It even does not smell as bad when printing. And it also can be used in the acetone vapor smoothing process, like ABS.

It carries a reasonable price, unlike many specialty materials available elsewhere.

FUTURE OF ASA FOR 3D PRINTING

While ASA has been available on the market for some time, I believe that Prusa Research's step to bring it forward as an alternative to ABS, which Prusa Research never offered. Their client base is so huge and their filament quality reputation is so high that it is likely many people will be trying out ASA for the first time, and perhaps they will like it.

Could this be the start of the end of ABS? Have we hit peak ABS? Perhaps, but this will play out over many years yet.

Meanwhile, if you want to try out ASA on your 3D printer, Prusa Research's offerings might be a good place to start.

Via Prusa Printers (https://blog.prusaprinters.org/asa-prusament-is-here-learn-everything-about-the-successor-to-abs/)

Featured





3D PRINTING NEWS

What's With The Silk Filaments? (/Blog/2020/2 With-The-Silk-Filaments)

There's increasing interest in "silk" 3D printer filaments, which are astonishingly shiny and now available from mainstream materials providers.

Feb 18, 2020

Formlabs' New Tough Resin (/Blog/2020/2 New-Tough-Resin)

Formlabs announced a new resin, Tough 1500 Resin, which has some interesting properties and could be used as a substitute for polypropylene.

Feb 13, 2020

The Metal X 3D Printer Gains Copper Metal (/Blog/2020/2 Metal-X-3d-Printer-Gains-Copper-Metal)

Markforged announced the availability of a new metal for their Metal X system: copper. We have the reasons why this is so important.

Feb 13, 2020

Structo's Deal For Advanced Materials (/Blog/2020/2 Deal-For-Advanced-Materials)

Dental 3D printing specialist has struck a deal to allow use of advanced resin on their all-in-one dental 3D printer.

Feb 5, 2020

A Much Better Soluble Support Material (/Blog/2020/: Much-Better-Soluble-Support-Material)

VXL's 3D printing materials are finally becoming more well-known after they began marketing directly to the public, including their non-hygroscopic soluble support material.

Feb 4, 2020

materials (/blog/category/materials)

filament (/blog/tag/filament), prusa (/blog/tag/prusa), spool (/blog/tag/spool), asa (/blog/tag/asa), $ASA Filament For 3D Printers (/blog/tag/%24ASA+Filament+For+3D+Printers)

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3D PRINTING NEWS

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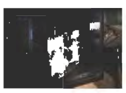

14 Aug 2019 Auburn X-Rays 3D Printed Parts

(/blog/2019/8/14/auburn-x-rays-3d-printed-parts)

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14 Aug 2019 Meet The Wi3DP Ambassadors, Part 2

(/blog/2019/8/14/meet-the-wi3dp-ambassadors-part-2)

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3D PRINTING NEWS

13 Oct 2019

Surprise! Prusa Announces MINI 3D Printer

Kerry Stevenson (/blog?author=509c2c3ae4b01d08db3d981f)

The new Original Prusa MINI 3D printer [Source: Prusa Research]

Prusa Research has unexpectedly announced a brand new 3D printer, the Original Prusa MINI (https://fabbaloo.com/blog/2019/10/13/surprise-prusa-announces-mini-3d-printer).

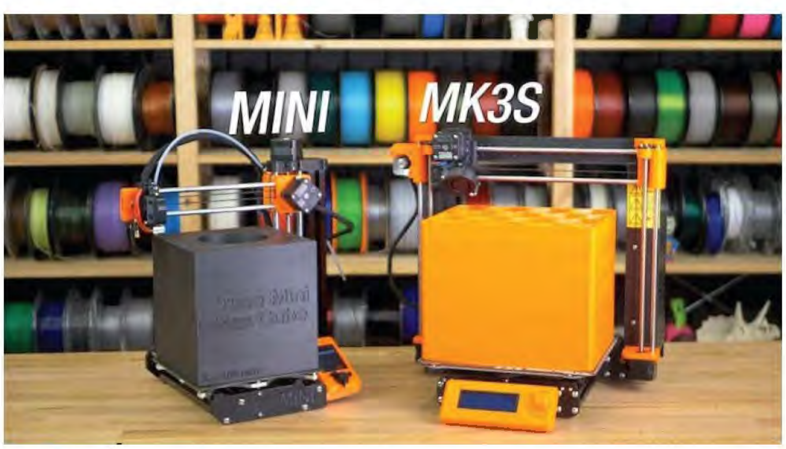
The Prague-based company has been extremely busy over the past year, deploying their flagship MK3S device, as well as the company's first SLA-based 3D printer, the SL1.

THE ORIGINAL PRUSA MINI 3D PRINTER

Now they've announced a new machine, the Original Prusa MINI. As you might expect, this machine is somewhat smaller than the standard-sized MK3S. However, though it is smaller in dimensions, it seems to have many of the features of its older sibling — and some surprises, too.

First, the basics.

ORIGINAL PRUSA MINI SPECIFICATIONS



Comparison of the maximum build volume of the Prusa MINI and Prusa MK3S [Source: Prusa Research]

The MINI does indeed have a smaller build volume, at only 180 x 180 x 180 mm. This is as compared to the MK3S's 250 x 210 x 210 mm. In truth, it really isn't that much smaller and the 180 mm dimension is likely large enough for almost all prints. Another way to look at this is to ask yourself how many times you have a print having dimensions between 180 and 210 mm? Not terribly often, I would guess.

One quite visible change from the MK3S is that the gantry is different. While the MK3S has a full U-shaped tower, the MINI does not. Instead it has a cantilevered configuration that uses far less material. It would appear that this style might have somewhat less stability, but it remains to be seen whether this is a significant factor.

Perhaps the most significant difference is that the MINI does not use a direct drive extruder. Instead it uses a Bowden extruder, where the motor is off to the side and pushes the filament through a tube to the hot end. This may result in challenges 3D printing flexible filament, although Prusa Research says flex is supported.

It goes without saying that the MINI is not capable of accepting an MMU2S (multi-material unit) upgrade, as the MK3S can. To be clear, there are some functional limitations of the MINI, but if they are an issue for you, choose the MK3S instead.

There are many identical features between the two machines, as the MINI has inherited quite a bit of technology. The same removable magnetic bed surface is used; the same hot end is used (although the MINI can hit only 280C, whereas the MK3S can hit 300C); automatic mesh bed leveling is incorporated; layer heights are the same. Because of this it's likely the MINI is able to produce high-quality prints.

ORIGINAL PRUSA MINI OPTIONS

Some features are optional on the MINI. A filament-out sensor, standard on the MK3S, is a US$20 option on the MINI. Similarly, there is an optional WiFi connection upgrade, which is not even available on the MK3S.

One MK3S feature that is not available on the MINI is recovery from power outages. Another is that the MINI is available only as a kit. However, the kit seems to be ridiculously simple to assemble as it contains only three components. Prusa Research says you can be up and running in less than 30 minutes.

That leads to the interesting part: there are some features on the MINI that are not available on the MK3S.

ORIGINAL PRUSA MINI COLOR SCREEN

One is a color screen! However, it's not a touchscreen and is operated by a wheel. This is a definite improvement over the increasingly-ancient-appearing LCD screen found on the MK3S.

You can see the new screen and the other features in the official Prusa Research video:

Original Prusa MINI is here: Smart an...

ORIGINAL PRUSA MINI FARM MODE

There's another very intriguing bit from Prusa Research: "Farm Mode".

It's not clear what this is, but Prusa Research says it's "coming soon". It is likely a mode in which arrays of MINIs can be operated in some type of production mode. Farm Mode is no doubt some variation of the system used by Prusa Research in their in-house production facility, so it likely is of good quality. I'll have a lot more thoughts about this development in the near future.

ORIGINAL PRUSA MINI PRICE

Finally, the best part. The price.

While the MK3S kit sells for US$749, the MINI is priced at an amazing US$349! If the MINI proves to produce high-quality prints and be as reliable as the MK3S, it will be a huge seller at that price point.

The price point is quite competitive with many low-priced Asian machines, so Prusa Research seems to be addressing that challenge head-on.

I'm hoping to be able to test one of these units in the future.

Via Prusa Blog (https://blog.prusaprinters.org/original-prusa-mini-is-here-smart-and-compact-3d-printer/) and Prusa Research (https://shop.prusa3d.com/en/3d-printers/994-original-prusa-mini.html)

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3D PRINTING NEWS

Which Of The Seven Multi-Color Filament 3D Printing Approach Is The Best? (/Blog/2020/2 Of-The-Seven-Multi-Color-Filament-3d-Printing-Approach-Is-The-Best)

There are several ways to perform multi-material 3D printing using filaments. What are the advantages and disadvantages of each?

Feb 5, 2020

What Is Consumer 3D Printing, And Does It Really Exist? (/Blog/2020/1, Is-Consumer-3d-Printing-And-Does-It-Really-Exist)

In response to recent controversy over the notion of "consumer 3D printing", I propose some alternate ways to look at the situation.

Jan 27, 2020

Thoughts From A Professional 3D Printer Maintenance Manager (/Blog/2020/1, From-A-Professional-3d-Printer-Maintenance-Manager)

We caught up with a professional 3D printer maintenance manager to understand his thoughts on repairing several types of 3D printers in a busy fabrication lab.

Jan 25, 2020

Hands On With The Prusa MMU2S, Part 3 (/Blog/2020/1, On-With-The-Prusa-Mmu2s-Part-3)

We tested the Prusa Research MMU2S multi-material 3D printer upgrade kit and learned a great deal about 3D printing. Part 3 deals with troubleshooting and eventual success.

Jan 21, 2020

Hands On With The Prusa MMU2S, Part 2 (/Blog/2020/' On-With-The-Prusa-Mmu2s-Part-2)

We tested the Prusa Research MMU2S multi-material 3D printer upgrade kit and learned a great deal about 3D printing. Part 2 deals with assembly and initial testing.

Jan 21, 2020

printer (/blog/category/printer)

prusa (/blog/tag/prusa), mini (/blog/tag/mini), thermoplastics (/blog/tag/thermoplastics), plastic (/blog/tag/plastic), filament (/blog/tag/filament), inexpensive (/blog/tag/inexpensive)

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3D PRINTING NEWS

KERRY STEVENSON (/BLOG?AUTHOR=509C2C3AE4B01D08DB3D981F)

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14 Oct 2019 Design Of The Week: Iron Man Statue

(/blog/2019/10/14/design-of-the-week-ironman-statue)

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12 Oct 2019 The End Of LulzBot (?)

(/blog/2019/10/12/the-end-of-lulzbot)

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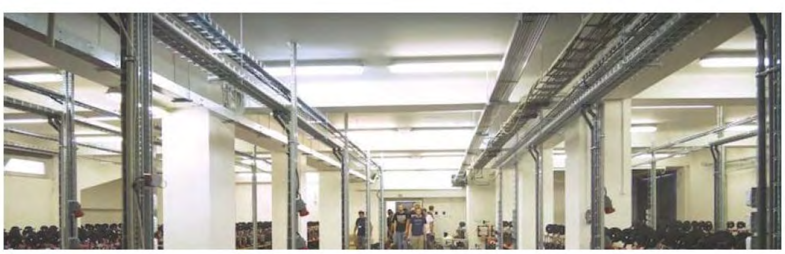
3D PRINTING NEWS

5 Sep 2019

Prusa Sets World Record By Simultaneously Running 1096 3D Printers

Kerry Stevenson (/blog?author=509c2c3ae4b01d08db3d981f)



Prusa Research sets the world record for simultaneously operating 3D printers [Source: YouTube]

We try to shy away from frivolous 3D print "world records" on this publication; most of them are trivial and often untrue.

But the story of this release of a video by Prusa Research has to be told, as they have accomplished a seemingly impossible feat: operating 1096 3D printers (https://fabbaloo.com/blog/2019/9/5/prusa-sets-world-record-by-simultaneously-running-1096-3d-printers) simultaneously. They even had officials from the Guinness Book of World Records on hand to certify the attempt.

The previous record was held by Airwolf3D, who in 2014 managed to operate 159 3D printers at the same time. But Prusa Research's feat is on another level entirely.

PRUSA WORLD RECORD ATTEMPT

Unlike any other party in the world, Prusa Research just happens to have 500 operating devices on hand: that's their factory that produces many of the plastic parts for their 3D printer models. In addition to that, they organized printers from staff's desks and a batch recently completed from the assembly line. In total, 1100 devices were online and ready to roll at the commencement of the test.

To put this in perspective, let's look at some of the logistics required to get this project done. Imagine setting up the following:

- 1100 3D printers were carefully setup in a large hall
- GCODE for a 13-minute print of a hexagon shape was placed on each printer

- 330 extension cords were used to distribute the considerable power required to run all 1100 machines
- 38 operators were assigned to run the devices, with responsibility for around 20 printers each

- 22 independent "stewards" officially supervised about 50 printers each, with an independent expert and referee to ensure validity

PRUSA WORLD RECORD PROCEDURE

Operators had a five-minute period to start all printers. That's about 14 seconds each! Somehow they managed to get them going, but in the process the lights must have dimmed in Prague as the huge 3D printer configuration drew 124kW of power. The video says the room containing many of the devices incurred a +10C temperature rise in only 10 minutes.

After the print session completed, the stewards collected the printed hexagons. These were inspected for completeness, and it turned out that four of the prints did not pass the test. This meant that "only" 1096 out of the 1100 machines "worked" for purposes of the record-setting attempt.

That's actually a very impressive statistic: a 99.64% success rate. Given the failure rate for many 3D printers, I believe this itself is an incredible demonstration of Prusa Research machine reliability.

[UPDATE] Per Josef Prusa, actually only a single printer failed in the test. The other three "failures" were "failures of the project", in that stewards mishandled apparently successfully completed prints. One steward removed a print assigned to another steward, a violation of the attempt's rules, and two other stewards somehow forgot to pick up one print each, leading to three mishandled — but evidently successful — prints. Assuming these three were successfully printed, the failure rate was only 1 out of 1100 3D printers, an actual success rate of 99.91%. I think this is quite incredible, as I'm used to seeing 3D printers that seem to fail once in every 3-4 print jobs.

What happens to all the 1096 prints? Evidently they are using them to create a gigantic mosaic. This record attempt is also a demonstration of the massive power of parallel 3D printing. Imagine producing 1096 hexagons on a single device: it would take a week and a half of continuous printing — and manual intervention.

Here's the entire video:

1096 3D printers running at the SAME...

FUTURE 3D PRINTING WORLD RECORDS

Could any other party attempt such a feat? Is there anywhere in the world you might find a collection of over a thousand devices all in one place? I really don't think there is such a place. Other high-volume manufacturers of 3D printers, such as Aleph Objects or XYZprinting, likely cannot match Prusa Research's volumes.

It's likely this record will not be broken — until Prusa Research decides to break it themselves in the future.

Via YouTube (https://www.youtube.com/watch?v=PEUIPJfVnSM)

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3D PRINTING NEWS

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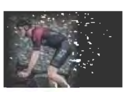

5 Sep 2019 Carbon Keeps 3D Printing In The Saddle With Fizik

(/blog/2019/9/5/carbon-keeps-3d-printing-in-the-saddle-with-fizik)

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5 Sep 2019 SkillCoach | Discovering R3DS Wrap 3 | The Perfect App For Preparing 3D Scan Data For MCAD!

(/blog/2019/9/5/skillcoach-discovering-r3ds-wrap-3)

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3D PRINTING NEWS

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3D PRINTING NEWS

22 Nov 2018

Prusa's Manufacturing Capacity Is Incredible

Kerry Stevenson (/blog?author=509c2c3ae4b01d08db3d981f)

Fabbaloo

3D PRINTING N

Josef Prusa himself with Fabbaloo's Business Manager, Marney Stapley [Source: Fabbaloo]

At formnext we learned much about Prusa Printer's manufacturing capabilities.

The Prague-based manufacturer of inexpensive desktop 3D printers has grown tremendously in the past three years, and their printers might now be the most frequently made 3D printer on the planet.

When we last spoke to the company directly regarding their production capacity, we were told they were producing an incredible 3,000 units per month. At that time the number was far larger than any other manufacturer we were aware of. To put this in perspective, MakerBot's first 3D printer, the venerable CupCake, likely sold fewer than 2,000 units in total. Prusa now made that many machines in only a couple of weeks.

But now things are quite a bit bigger, somehow.

The company now has staff numbering around 400, and their production line is, as it always has been, made up of their own 3D printers. These machines produce the parts required for making more printers. We're told a machine can produce a full set of parts in about 15 hours.

Now their manufacturing farm numbers around 350, and we strongly suspect they continue to add more units as we speak.

How many units are they actually producing now? Is it more than the 3,000 we were told last year?

Yes, indeed. We were told Prusa now produces about 450 units per day. Wait, let's read that again: **FOUR HUNDRED AND FIFTY 3D PRINTERS EVERY DAY**!

If they're running a seven-day-a-week operation, this is equivalent to 3,150 units per week, 13,500 units per month, or a staggering 164,250 units per year.

And they're expanding. And these numbers don't even count the new inexpensive resin machine they announced (https://www.fabbaloo.com/blog/2018/9/22/surprise-prusa-announces-resin-3d-printer-the-sl1) but have yet to ship in volume.

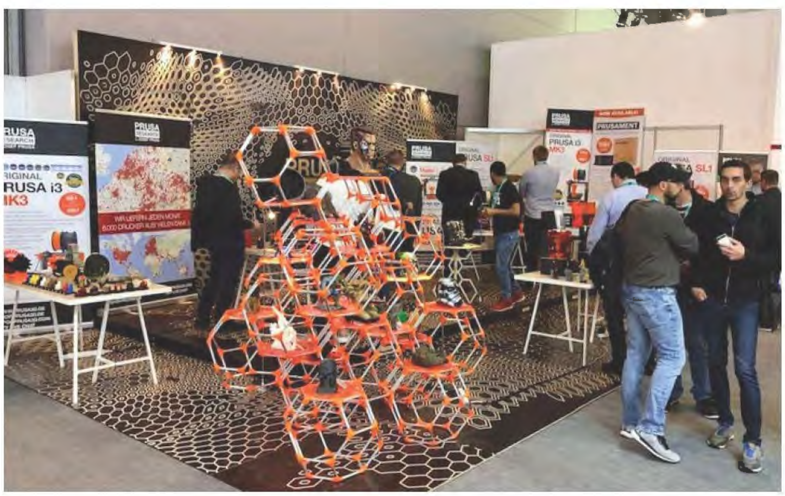
They have to be the largest manufacturer of 3D printer units in the world. Of course, their equipment is very low cost, so they likely have lower revenue than some other companies. Or do they?

Prusa's new resin 3D printer [Source: Fabbaloo]

We don't know their specific sales by model, but the average price of all their filament machines is just over US$800. And 164,500 of them yields a massive revenue of US$133,500,000! And this does not yet count their resin machines, which are priced quite a bit higher.

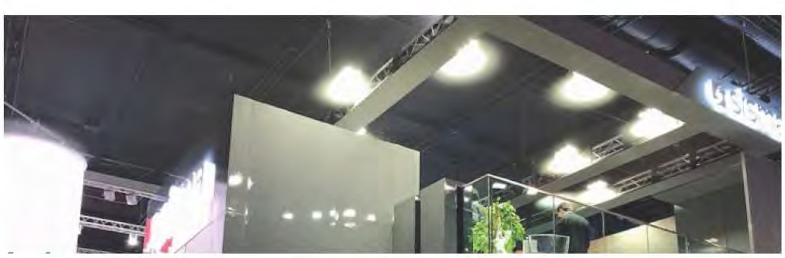
If they have a margin of, say 10% on this revenue, that's US$13M. But their margin might be higher.

The bottom line here is this company is pulling in an astounding amount of money, far more than almost every company we saw among the 626 vendors at formnext. I was quite amused when I saw Prusa's modest booth:



Prusa's very modest booth at formnext 2018 [Source: Fabbaloo]

When compared to their flashy neighbors:



A very flashy exhibition stand at formnext 2018 adjacent to Prusa's modest booth [Source: Fabbaloo]

Which company is making more money? Hard to tell from appearances. But the numbers speak.

3D printed sample from Prusa's new resin machine [Source: Fabbaloo]

At this point it appears that Prusa is now the low-cost desktop 3D printer manufacturer that countless others envisioned when they started their journey. While most have fallen in their voyage, Prusa has achieved total success.

Via Prusa Printers (https://www.prusaprinters.org)

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(/blog/2018/11/22/dsm-adds-umbrella-of-sustainability-to-additive-manufacturing)

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22 Nov 2018 Knuckle Down: Four Approaches To Getting 3D Model Data In Hand

(/blog/2018/11/22/knuckle-down-four-approaches-to-getting-3d-model-data-in-hand)

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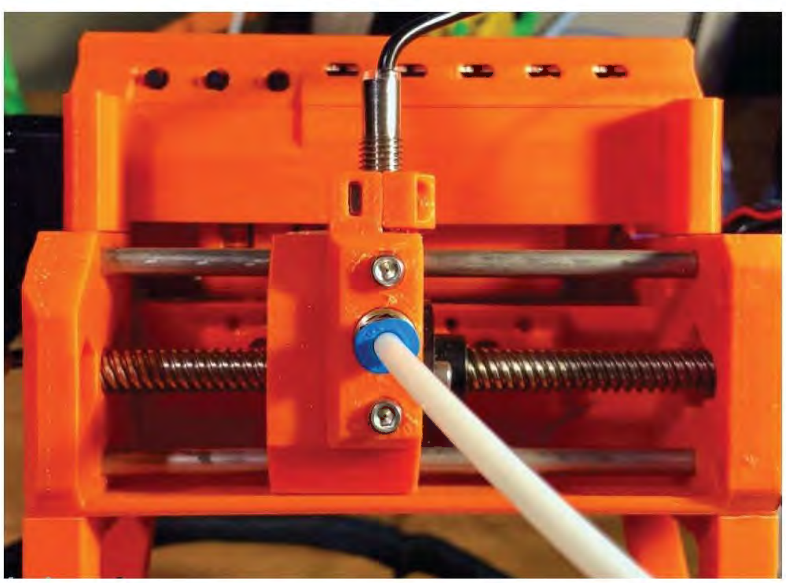
21 Jan 2020

Hands On With The Prusa MMU2S, Part 1

Kerry Stevenson (/blog?author=509c2c3ae4b01d08db3d981f)



We review the Prusa MMU2S multi-material upgrade [Source: Fabbaloo]

3D PRINTING NEWS

This is part 1 of a 3 part series on using the Prusa Research MMU2S multi-material upgrade. You can find [part 2 here](https://fabbaloo.com/blog/2020/1/21/hands-on-with-the-prusa-mmu2s-part-2) (https://fabbaloo.com/blog/2020/1/21/hands-on-with-the-prusa-mmu2s-part-2) *and* [part 3 here](https://fabbaloo.com/blog/2020/1/21/hands-on-with-the-prusa-mmu2s-part-3) (https://fabbaloo.com/blog/2020/1/21/hands-on-with-the-prusa-mmu2s-part-3).

I've finally managed to successfully build a Prusa MMU2S multi-material system.

This review is a very long time coming, and the reasons for this lengthy delay will become evident as you read through the story. The entire upgrade process has been perhaps the most challenging, frustrating and at the same time rewarding experiences I've had using 3D printers in my now 13 years of use.

PRUSA MMU2S ORDER

It began in September, 2018, when I ordered a MMU2 upgrade kit.

Previously I had very successfully operated an Original Prusa i3 MK2.5S desktop 3D printer in the lab, one of the finest 3D printers I've ever used. It produced tremendously good output and was extremely reliable, able to 3D print anything, even over the course of days.

When Prusa Research announced a multi-material upgrade I, like many others, was intrigued by the notion of converting this highly reliable device into one that could print many colors in the same 3D print job especially at the rock-bottom price of US$299. However, before I got around to ordering the upgrade kit, Prusa Research abruptly changed the MMU design completely to a much more simplified form, the MMU2.

I placed an order in September of 2018 and awaited delivery. However, Prusa Research again delayed shipping as they were once again redesigning the MMU, which eventually became the MMU2S. This is what I eventually received in April 2019, seven months after ordering.

PRUSA MMU CONCEPT

Before we get into the gory details of my experience, let's understand the principles of the Prusa MMU2S.

The base 3D printers to which this upgrade can be applied are the current flagship 3D printer from the company, the Original Prusa MK3S and its predecessor, the Original Prusa MK2.5S. In either case the device is transformed into a different 3D printer; they require different slicing treatment and must be selected as such in the software. In other words, if you upgrade a MK2.5S with the MMU2 kit, you don't have a MK2.5S anymore; you have a "MK2.5S MMU2".

Both of the base 3D printers are filament-powered machines, and thus the idea here is to use different filaments within a print job to achieve multi-material capability. However, since there is only one nozzle on the device, it means there must be a mechanism to swap filaments on the fly. That is the core concept of the Prusa MMU upgrades.

MULTI-NOZZLE EXTRUSION

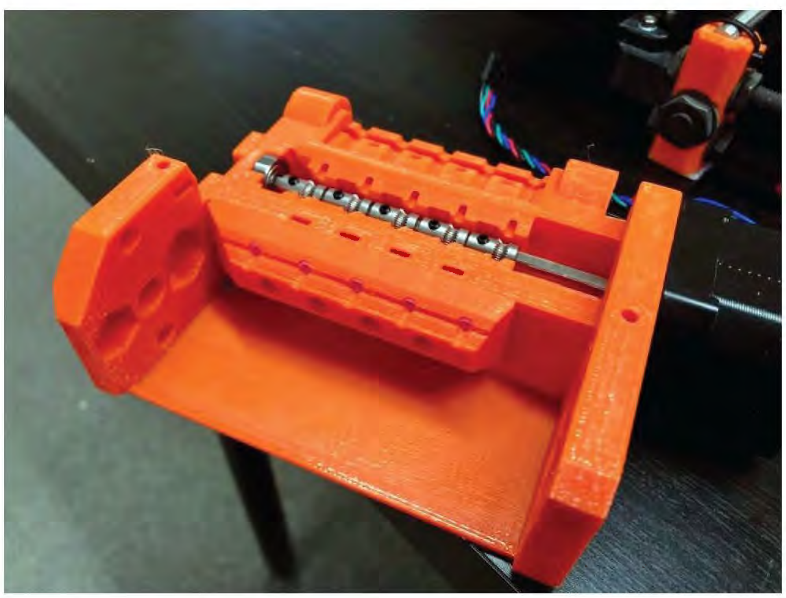
Most other multi-material 3D printers employ multiple nozzles, but there are many issues with them, aside from being more expensive due to multiple copies of the hardware. The major issue is that the nozzles must all have perfectly calibrated alignment, otherwise the multi-color sections will not be properly joined. It's quite a pain to deal with this, I can attest. But there are no such issues when pushing it all through a single nozzle.

A single nozzle approach does introduce the problem of color mixing. If you switch filaments, there is a residual amount of the previous filament still in the hot end, and that must be purged to obtain a "clean" flow of new filament. In practice, this means the MMU2S systems must squirt out some waste material on each filament change, using up more material and dramatically increasing the print job duration.

MMU FILAMENT SWAPPING

But how does the MMU2S swap filaments? Prusa Research has designed an ingenious and relatively simple mechanical system to do so.

The MMU2S unit sits atop the 3D printer, and up to five filaments are fed into it. The idea here is that a "selector" slides horizontally across the bank of filaments and engages the one filament that's selected.



Gears that drive filaments when engaged by the Prusa MMU2S multi-material selector [Source: Fabbaloo]

A motor pushes the engaged filament down a PTFE tube to the extruder that's still mounted on the 3D printer's toolhead, in a manner similar to what you'd see on a Bowden-style (https://www.fabbaloo.com/blog/2015/11/11/bowden-or-direct-a-primer-on-extruder-styles) system.

The still-existing extruder motor and gears catches the filament as it arrives and then takes on the role of pushing it through the hot end as it would normally do.

3D printing then takes place normally, except that occasionally the filament must be swapped. When this happens the filament is pulled up and back to the "ready" state in the MMU2S, and the selector moves to engage another filament and the process repeats.

The number of filament swaps on a given 3D print job is quite variable. It could be as low as once, but in a large, complex multi-color object it might be a hundreds. Or a thousand. Or even more.

The concept I've just described seems fairly straightforward, and thus you would expect the upgrade process to proceed normally. However, for me — and many MMU2S upgraders — that was simply not the case.

PRUSA MMU2S ASSEMBLY INSTRUCTIONS

Just a few parts for the Prusa MMU2S multi-material upgrade [Source: Fabbaloo]

Excitedly, I opened the upgrade box I received from Prusa Research and quickly found bags of parts. Many, many parts. I wondered exactly how difficult this could be to perform the assembly.

I reviewed Prusa Research's typically easy-to-follow online instructions. The first thing I realized is that Prusa Research now has several different machine models and you must be very careful to select the right documentation for your particular machine scenario. In my case, I used the "Original Prusa i3 MK3S/MK2.5S & MK3/MK2.5 to MMU2S" instructions, as opposed to any of these possibly relevant instruction, but similarly-named sets:

- Original Prusa i3 MK2 MMU1 to MK2.5S MMU2S
- Original Prusa i3 MK2/S to MMU1
- Original Prusa i3 MK2/S to MMU1
- Original Prusa i3 MK2S MMU1 to MK2.5 MMU2 v1.00
- Original Prusa i3 MK2S MMU1 to MK2.5 MMU2 Original Prusa i3 MK3/MK2.5 to MMU2 v1.01
- Original Prusa i3 MK3/MK2.5 to MMU2 v1.01

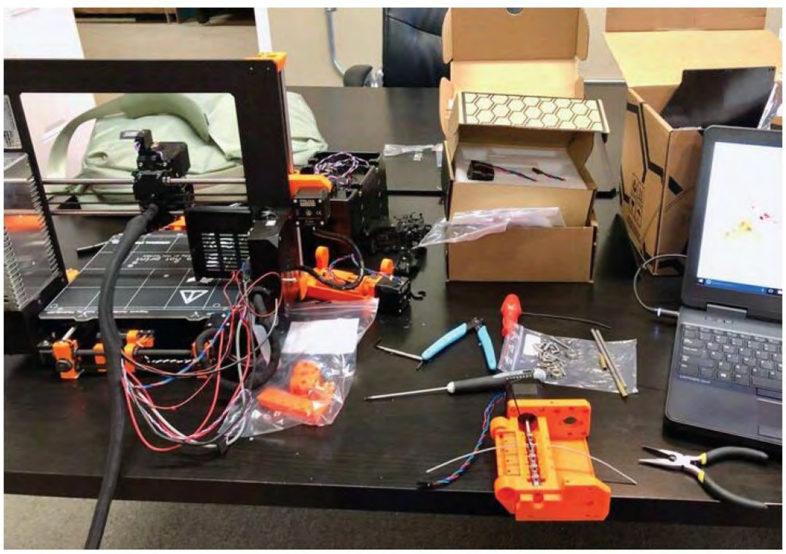
My advice is to be very aware of the specific machine models at all times when looking at Prusa Research documentation! Read every model and version number or else you could find yourself going down the wrong path.

The instructions seemed a little daunting to me, a part-time hardware person. For those accustomed to using pre-assembled equipment, the MMU2S upgrade is definitely not for you. You must have some experience building machines to have a hope of getting through to the end successfully.

The instructions are divided into eight major sections as follows:

- MK3/MK2.5 extruder disassembly (Moderate difficultly, 16 steps)
- MK3S/MK2.5S extruder disassembly (Moderate, 10 steps)
- MK3/MK2.5 extruder upgrade (Moderate, 65 steps)
- MK3S/MK2.5S extruder upgrade (Moderate, 19 steps)
- Idler body assembly (Easy, 15 steps)
- Pulley body assembly (Moderate, 36 steps)
- Electronics and MMU2S unit assembly (Difficult, 32 steps)
- Spool holder and buffer assembly (Easy, 22 steps)
- Preflight check (Easy, 15 steps)

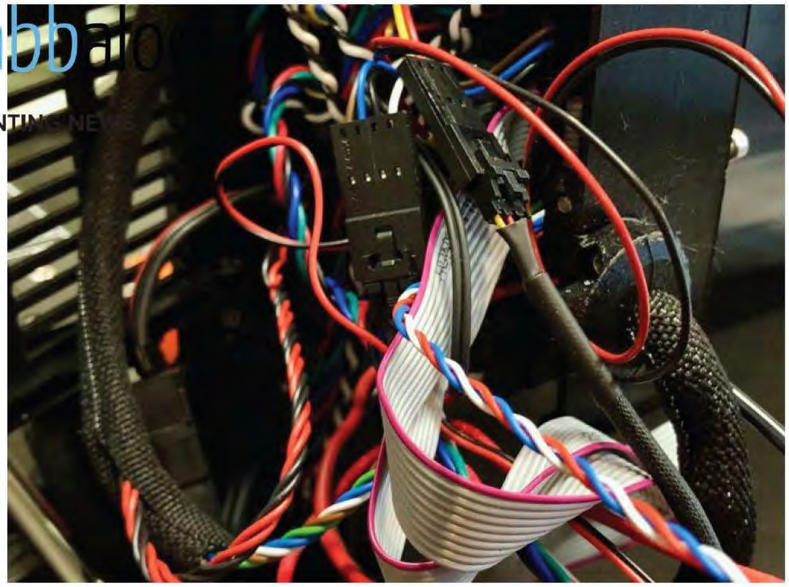
Note that the instructions have mixed in MK3 / MK3S / MK2.5 / MK2.5S machines, so it is critical you stay on the right path. Several times when I resumed working on the upgrade, I accidentally ended up in the wrong section and got terribly confused.



Assembling the Prusa MMU2S multi-material upgrade [Source: Fabbaloo]

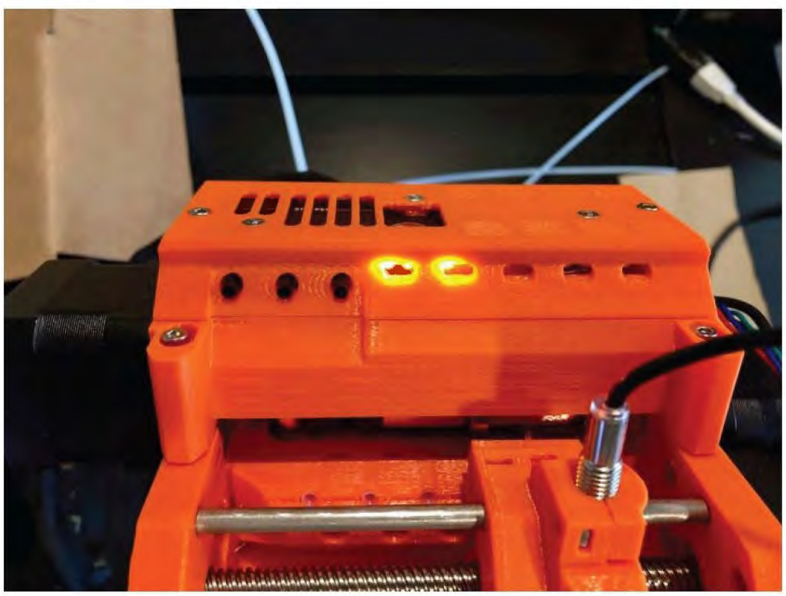
There's a lot of steps here: for the MK3/MK2.5 it's 201 steps in total, and for the MK3S/MK2.5S, it's "only" 149 steps. You will spend many hours building this kit. The non-"S" models have more steps because you're basically upgrading the extruder to the S level as part of the MMU2S upgrade.

Perhaps the trickiest stage was wiring up all the electronics, as was marked the most difficult step. Here we see the bundle of wires where you must very carefully plug the correct cable into the correct port on the controller board. Fortunately, the cables are properly labeled and it's not that complicated.



Electronics hookups on the Prusa MMU2S multi-material upgrade [Source: Fabbaloo]

PRUSA MMU2S INITIAL TESTING



Powering on the Prusa MMU2S multi-material upgrade [Source: Fabbaloo]

I managed to struggle through the steps by taking my time, double-checking every step, re-reading and visualizing what to do. After far too many hours, I had completed the assembly of the MMU2S.

Now it was time to move on to power up and testing.

I had thought the lengthy and tedious assembly process would be the worst part of the upgrade.

I was wrong.

Very wrong. Assembly turns out to be the easiest part of the MMU journey.

This is part 1 of a 3 part series on using the Prusa Research MMU2S multi-material upgrade. You can find part 2 here (https://fabbaloo.com/blog/2020/1/21/hands-on-with-the-prusa-mmu2s-part-2) *and* part 3 here (https://fabbaloo.com/blog/2020/1/21/hands-on-with-the-prusa-mmu2s-part-3).

Via Prusa Research (https://shop.prusa3d.com/)

hardware (/blog/category/hardware)

prusa (/blog/tag/prusa), mmu2s (/blog/tag/mmu2s), mmu (/blog/tag/mmu), multicolor (/blog/tag/multicolor), multimaterial (/blog/tag/multimaterial), upgrade (/blog/tag/upgrade), hands on (/blog/tag/hands+on)

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KERRY STEVENSON (/BLOG?AUTHOR=509C2C3AE4B01D08DB3D981F)

Kerry Stevenson, aka "General Fabb" has been writing Fabbaloo posts since he launched the venture in 2007, with an intention to promote and grow the incredible technology of 3D printing across

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3D PRINTING NEWS

the world. So far, it seems to be working!

Website (http://fabbaloo.com)

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21 Jan 2020 Hands On With The Prusa MMU2S, Part 2

(/blog/2020/1/21/hands-on-with-the-prusa-mmu2s-part-2)

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21 Jan 2020 Book Of The Week: 3D Printing Of Concrete

(/blog/2020/1/21/book-of-the-week-3d-printing-of-concrete)

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3D PRINTING NEWS

12 Jul 2019

Secrets of Prusa Research 3D Printer Manufacturing

Kerry Stevenson (/blog?author=509c2c3ae4b01d08db3d981f)

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Joel Telling and Josef Prusa [Source: YouTube]

3D PRINTING NEWS

A new video explores the secrets of Prusa Research's manufacturing empire (https://fabbaloo.com/blog/2019/7/12/secrets-of-prusa-research-3d-printer-manufacturing).

PRUSA FACTORY TOUR

Fabbaloo friend Joel Telling of the popular 3D Printing Nerd YouTube channel recently visited Prague, Czechia to tour the enormous factory that produces untold thousands of desktop 3D printers every month.

I've always gotten a lot from factory or site tours, as you can deduce all kinds of interesting facts from observations of activities and objects within sight. Most of the time "plant tour" videos don't do justice to what they portray, but Telling's video is one of the best we've seen to pick up the best details.

Prusa Factory Tour! Print Farm / Prus...

Telling, led by Prusa Research founder Josef Prusa, takes us through the several sections of the now-vast 3D printer factory, including the newly built filament production facility and the famous 3D print farm where Prusa Research produces many of the parts for their products.

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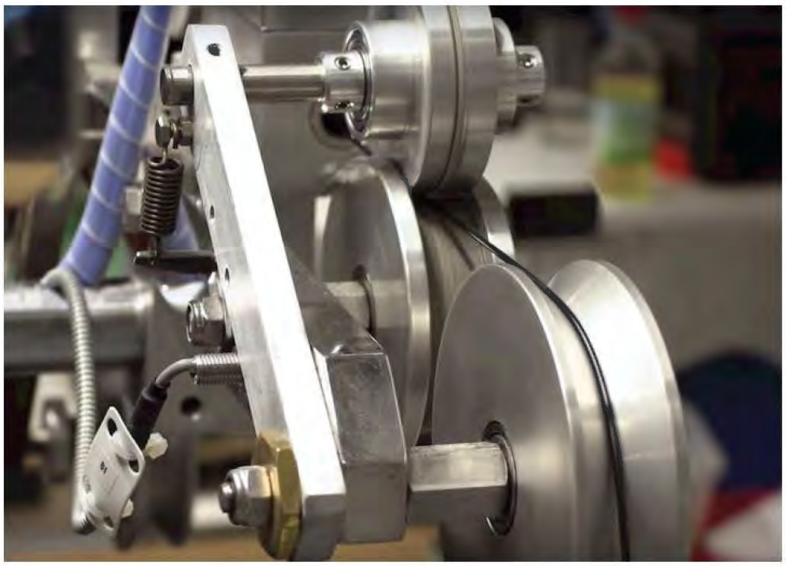
3D PRINTING NEWS

PRUSAMENT PRODUCTION



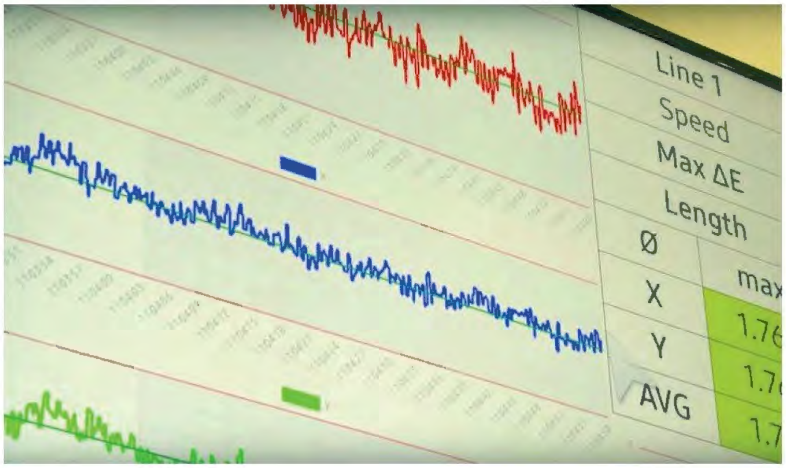
Some of the many components in the Prusament production facility [Source: YouTube]

The filament production tour alone is worth the watch, as you will see how Prusa Research produces their premium 3D printer filament, Prusament (https://www.fabbaloo.com/blog/2018/9/25/prusament).

What you will notice is the extreme steps taken to ensure this filament is of the highest quality. The temperatures and moisture levels are precisely calibrated and controlled throughout the process. Diameters and even color are monitored by the millisecond to ensure accuracy, which is recorded and printed with each and every spool as proof of the quality.

After watching that you will understand how questionable the activity of attempting to produce your own filament with rudimentary equipment really is. Homemade efforts may look like filament, but it cannot be of the highest quality, or even close to it. Today you can purchase very high-quality filament like Prusament for very reasonable pricing.

PRUSA PRINTER QUALITY



Prusament real-time quality monitoring log [Source: YouTube]

The video tour continues as Josef Prusa explains the assembly of components into machines. But what is incredibly interesting is that the actual "assembly" steps are not really the focus of the video, nor likely of Prusa Research itself. Instead there is considerable effort spent on ensuring the quality of all the components and assemblies.

The video shows specialized testing equipment and processes employed on virtually every component that make up the Prusa devices. After seeing this, you will then understand why Prusa Research's products are considered among the most reliable and highest quality in the industry: they spent an amazing amount of time and effort to make sure that happens.

It's also a bit of a statement towards other 3D printer manufacturers, especially those who may not take as many steps for ensuring quality. This is what they are competing against, and it's really hard to do so.

STARTING A 3D PRINTER COMPANY

This suggests that the barrier to entry into the desktop 3D printer market is quite a bit higher than one might suspect. It's one thing to make a prototype device, but quite another to manufacture tens of thousands of devices, all with consistently high quality.

Those of you thinking of starting a 3D printer company at this point, please watch this video carefully several times to see what you are up against. You may reconsider your project.

Meanwhile, I would very much like to visit this factory myself some time in the future when the stars align.

Via YouTube (https://www.youtube.com/watch?v=BjoQw5fGk6Q)

Featured >

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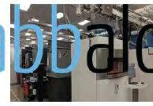    

3D PRINTING NEWS

The Non-Obvious Additive Manufacturing Needs Of Contract Manufacturing (/Blog/2019/9/Non-Obvious-Additive-Manufacturing-Needs-Of-Contract-Manufacturing)

A lot goes into the business of contract manufacturing, and a recent visit to Stratasys Direct Manufacturing highlighted some major considerations.

Sep 5, 2019

Inside Stratasys Direct Manufacturing: Aerospace & Traceability (/Blog/2019/8/Stratasys-Direct-Manufacturing-Aerospace-Amp-Traceability)

We visited Stratasys Direct Manufacturing in Texas for an inside look into operations including aerospace-qualiifed 3D printing.

Aug 22, 2019

Tour Of "Next Big Thing", German IoT Incubator, At Factory Berlin (/Blog/2019/8/Of-Next-Big-Thing-German-Iot-Incubator-At-Factory-Berlin)

We head to Berlin, Germany in the 2nd installment of my Euro tour learning about HW tech development across the pond.

Aug 22, 2019

SLM Solutions' Operations Updates (/Blog/2019/8/Solutions-Operations-Updates)

I recently visited SLM Solutions North America, and during that visit learned more about how the company has been updating its operations and strategies.

Aug 7, 2019

The Original In SLM 3D Printing: Inside SLM Solutions (/Blog/2019/7/Original-In-Slm-3d-Printing-Inside-Slm-Solutions)

We visited SLM Solutions North America for a look inside the original SLM metal 3D printing systems and a discussion of their approach to the market.

Jul 24, 2019

video (/blog/category/video)

tour (/blog/tag/tour), 3D Printing Nerd (/blog/tag/3D+Printing+Nerd), video (/blog/tag/video), prusa (/blog/tag/prusa), prusament (/blog/tag/prusament), factory (/blog/tag/factory), $Prusa Factory Tour (/blog/tag/%24Prusa+Factory+Tour)

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Website (http://fabbaloo.com)

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13 Jul 2019 Another World's First Chocolate 3D Printer!

(/blog/2019/7/13/another-worlds-first-chocolate-3d-printer)

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12 Jul 2019 Developing The "Largest, Fastest, Most Precise" Metal 3D Printer

(/blog/2019/7/12/developing-the-largest-fastest-most-precise-metal-3d-printer)

WIKIPEDIA

Forbes

Forbes (/fɔːrbz/) is an American business magazine. Published bi-weekly, it features original articles on finance, industry, investing, and marketing topics. *Forbes* also reports on related subjects such as technology, communications, science, politics, and law. Its headquarters is located in Jersey City, New Jersey. Primary competitors in the national business magazine category include *Fortune* and *Bloomberg Businessweek*. Forbes has international editions in Asia and Europe.

The magazine is well known for its lists and rankings, including of the richest Americans (the Forbes 400), of the America's Wealthiest Celebrities, of the world's top companies (the Forbes Global 2000), 30 Under 30, World's 100 Most Powerful Women, and The World's Billionaires.[3] The motto of *Forbes* magazine is "Change the World".[4] Its chair and editor-in-chief is Steve Forbes, and its CEO is Mike Federle.[5] In 2014, it was sold to a Hong Kong-based investment group, Integrated Whale Media Investments.[6][7]

Forbes

Cover for December 20, 2010, featuring Julian Assange

Editor-in-chief	Steve Forbes
Editor	Randall Lane[1]
Categories	Business magazine
Frequency	Biweekly
Total circulation (2013)	931,558[2]
First issue	September 15, 1917
Company	Forbes Media, LLC (51%) Forbes family (49%)
Country	United States
Based in	Jersey City, New Jersey, U.S.
Language	English
Website	forbes.com (http://forbes.com/)

Contents

Company history

B. C. Forbes, a financial columnist for the Hearst papers, and his partner Walter Drey, the general manager of the *Magazine of Wall Street*,[8] founded *Forbes* magazine on September 15, 1917.[9][10] Forbes provided the money and the name and Drey provided the publishing expertise. The original name of the magazine was *Forbes: Devoted to Doers and Doings*.[8] Drey became vice-president of the B.C. Forbes Publishing Company,[11] while B.C. Forbes became editor-in-chief, a post he held until his death in 1954. B.C. Forbes was assisted in his later years by his two eldest sons, Bruce Charles Forbes (1916–1964) and Malcolm Stevenson Forbes (1917–1990).

ISSN	0015-6914 (https://www.worldcat.org/search?fq=x0:jrnl&q=n2:0015-6914)

Bruce Forbes took over on his father's death, and his strengths lay in streamlining operations and developing marketing.[9] During his tenure, 1954–1964, the magazine's circulation nearly doubled.[9]

The former headquarters of Forbes on 5th Avenue in Manhattan (now owned by New York University)

On Bruce's death, his brother Malcolm Stevenson Forbes became President and Chief executive of Forbes and Editor-in-Chief of *Forbes* magazine.[12] Between 1961 and 1999 the magazine was edited by James Michaels.[13] In 1993, under Michaels, *Forbes* was a finalist for the National Magazine Award.[14] In 2006, an investment group Elevation Partners that includes rock star Bono bought a minority interest in the company with a reorganization, through a new company, Forbes Media LLC, in which Forbes Magazine and Forbes.com, along with other media properties, is now a part.[12][15] A 2009 *New York Times* report said: "40 percent of the enterprise was sold ... for a reported $300 million, setting the value of the enterprise at $750 million." Three years later, Mark M. Edmiston of AdMedia Partners observed, "It's probably not worth half of that now."[16] It was later revealed that the price had been US$264 million.[17]

Sale of headquarters

Forbes Building on Fifth Avenue in New York City (now owned by New York University)

In January 2010, *Forbes* reached an agreement to sell its headquarters building on Fifth Avenue in Manhattan to New York University; terms of the deal were not publicly reported, but Forbes would continue to occupy the space under a sale-leaseback arrangement.[18] The company's headquarters subsequently moved to the Newport section of downtown Jersey City, New Jersey, in 2014.[19][20]

Sale to Integrated Whale Media (51% stake)

In November 2013, Forbes Media, which publishes *Forbes* magazine, was put up for sale.[21] This was encouraged by minority shareholders Elevation Partners. Sale documents prepared by Deutsche Bank revealed that the publisher's 2012 EBITDA was US$15 million.[22] *Forbes* reportedly sought a price of US$400 million.[22] In July 2014, the Forbes family bought out Elevation and then sold a 51 percent majority of the company to Integrated Whale Media Investments.[6][7][17]

Other publications

Apart from *Forbes* and its lifestyle supplement, *Forbes Life*, other titles include *Forbes Asia* and fifteen local language editions. Steve Forbes and his magazine's writers offer investment advice on the weekly Fox TV show *Forbes on Fox* and on *Forbes on Radio*. Other company groups include Forbes Conference Group, Forbes Investment Advisory Group and Forbes Custom Media. From the 2009

Times report: "Steve Forbes recently returned from opening up a *Forbes* magazine in India, bringing the number of foreign editions to 10." In addition, that year the company began publishing *ForbesWoman*, a quarterly magazine published by Steve Forbes's daughter, Moira Forbes, with a companion Web site.[16]

The company formerly published *American Legacy* magazine as a joint venture, although that magazine separated from Forbes on May 14, 2007.[23]

The company also formerly published *American Heritage* and *Invention & Technology* magazines. After failing to find a buyer, Forbes suspended publication of these two magazines as of May 17, 2007.[24] Both magazines were purchased by the American Heritage Publishing Company and resumed publication as of the spring of 2008.[25]

Forbes has published the *Forbes Travel Guide* since 2009.

In 2013, Forbes licensed its brand to Ashford University, and assisted them launch the Forbes School of Business & Technology.[26] Forbes Media CEO Mike Federle justified the licensing in 2018, stating that "Our licensing business is almost a pure-profit business, because it's an annual annuity."[27] Forbes would launch limited promotions for the school in limited issues. Forbes would never formerly endorse the school.

On January 6, 2014, *Forbes* magazine announced that, in partnership with app creator Maz, it was launching a social networking app called "Stream". Stream allows Forbes readers to save and share visual content with other readers and discover content from *Forbes* magazine and Forbes.com within the app.[28]

Forbes.com

Forbes.com is part of Forbes Digital, a division of Forbes Media LLC. Forbes's holdings include a portion of RealClearPolitics. Together these sites reach more than 27 million unique visitors each month. Forbes.com employs the slogan "Home Page for the World's Business Leaders" and claimed, in 2006, to be the world's most widely visited business web site.[29] The 2009 *Times* report said that, while "one of the top five financial sites by traffic [throwing] off an estimated $70 million to $80 million a year in revenue, [it] never yielded the hoped-for public offering".[16]

Forbes.com uses a "contributor model" in which a wide network of "contributors" writes and publishes articles directly on the website.[30] Contributors are paid based on traffic to their respective Forbes.com pages; the site has received contributions from over 2,500 individuals, and some contributors have earned over US$100,000, according to the company.[30] *Forbes* currently allows advertisers to publish blog posts on its website alongside regular editorial content through a program called BrandVoice, which accounts for more than 10 percent of its digital revenue.[31] Forbes.com also publishes subscription investment newsletters, and an online guide to web sites, *Best of the Web*. In July 2018 Forbes deleted an article by a contributor who argued that libraries should be closed, and Amazon should open bookstores in their place.[32]

David Churbuck founded *Forbes*'s web site in 1996. The site uncovered Stephen Glass's journalistic fraud in *The New Republic* in 1998, an article that drew attention to internet journalism. At the peak of media coverage of alleged Toyota sudden unintended acceleration in 2010, it exposed the California "runaway Prius" as a hoax, as well as running five other articles by Michael Fumento challenging the entire media premise of Toyota's cars gone bad. The site, like the magazine, publishes many lists focusing on billionaires and their possessions, especially expensive homes, a critical aspect of the website's popularity.[33]

Currently, the website also blocks internet users using ad blocking software (such as Adblock Plus) from accessing articles, demanding that the website be put on the ad blocking software's whitelist before access is granted.[34] Forbes argues that this is done because customers using ad blocking software do not contribute to the site's revenue. Malware attacks have been noted to occur from Forbes site.[35]

See also

- Forbes 500
- Forbes 30 Under 30

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External links

- Official website (https://www.forbes.com/)

Wohlers Report 2018: 3D Printer Industry Tops $7 Billion

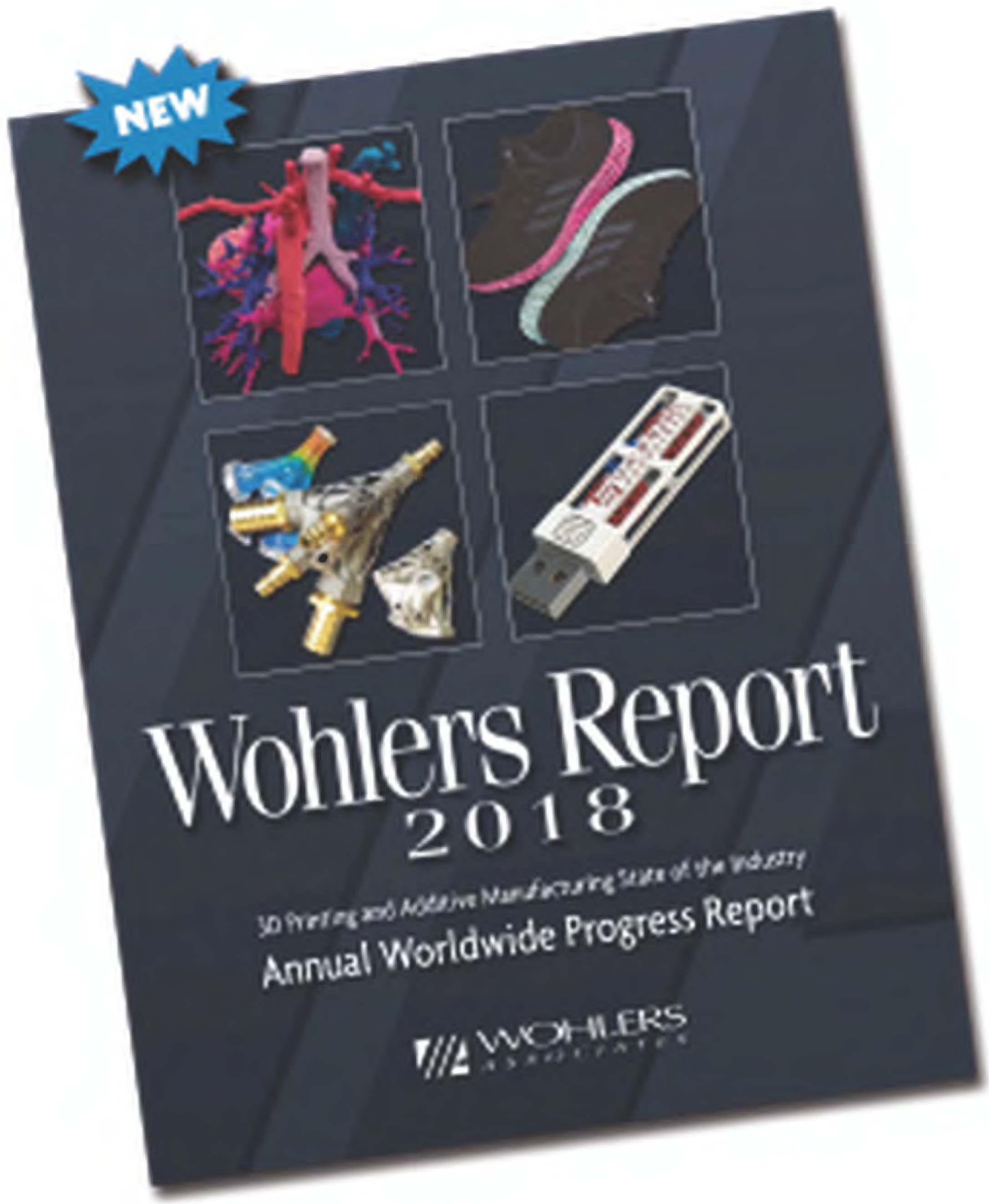
TJ McCue Contributor ⓘ
Consumer Tech

TWEET THIS

AM industry exceeds $7.3 billion

Wohlers Associates is recognized as one of the preeminent 3D printer experts in the world. Their detailed annual report on the state of the 3D printing industry -- the eponymous ***Wohlers Report 2018*** -- reveals significant increases in metal additive manufacturing (AM) this year. Investors will appreciate the solid 21 percent growth as the AM industry exceeds $7.3 billion .

While some industry reports focus on projections of where the market is heading, the Wohlers Report compiles details on how many 3D printers are actually sold each year. According to the new report, an estimated 1,768 metal AM systems were sold in 2017, compared to 983 systems in 2016, a surge of nearly 80 percent.



Disclosure and note: I received a media copy of the 2018 report and have been following Wohlers Associates analyses for many years. I served as a technical editor for one of the annual reports several years ago. Additive Manufacturing is used synonymously with 3D printing.

The growth is not in machines alone, but more companies are making the machines as well. The firm found that 135 companies around the world produced and sold industria AM systems in 2017, up from 97 companies in 2016. New system manufacturers are entering the AM market at a dizzying pace while releasing machines with open materia platforms, faster print speeds, and lower pricing.

In my post from 2016, Wohlers Report 2016: 3D Printer Industry Surpassed $5.1 Billio I quoted from the report that "More than 278,000 desktop 3D printers (under $5,000) were sold worldwide last year (2015), according to Wohlers Associates." The 2018 repo has the estimated number of desktop systems sold at nearly double the 2015 data (reported in the 2016 report). **In just over two years, an astonishing 528,952 desktop 3D printers (or systems) are believed to have been sold**. Extensive research and in-depth surveys with market players help the firm determine how many units are sold each year.

The desktop 3D printer category, within the Wohlers Report 2018, mentions products and kits from some of the best-known manufacturers, including Aleph Objects (makers of the LulzBot line, which I've written about here and here), MakerBot, Ultimaker (recent post here), and many others. Wohlers estimates that revenues from the desktop segment were well over $500 million in 2017.

According to Wohlers Report 2018: "In 2017, the AM industry, consisting of all AM products and services worldwide, grew 21% to $7.336 billion. The growth in 2017 compares to 17.4% growth in 2016 when the industry reached $6.063 billion and 25.9% growth in 2015... The total industry estimate of $7.336 billion excludes internal investments from the likes of Airbus, Adidas, Ford, Toyota, Stryker, and hundreds of other companies, both large and small. A surprising number of the $1-5 billion companies – many of which are unfamiliar to most of us – are investing in AM R&D (research and development)."

At 344 pages, *Wohlers Report 2018* is packed with insights and details that allow me to keep up with this fast-growing industry. Though the industry is perhaps still a bit misunderstood, Wohlers Associates makes sense of it all. You can get details on the nev annual state of the industry report at the Wohlers Associates website.

Reference for the 2017 report here on Forbes is found in my post: RAPID + TCT 2017 Event To Demonstrate $6 Billion 3D Printing Industry Strength

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TJ McCue

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Jan 8, 2020, 03:26pm

The Best 3-D Printers of 2020

Anthony Karcz Senior Contributor
Consumer Tech
I write about how to do more with your consumer gadgets.

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Does a watched 3D printer ever print? GETTY

3-D printers offer an alluring promise. All you need is a little plastic and some technica know-how, and you can print a physical copy of almost anything.

But as soon as you start to scratch the surface, it's apparent that 3-D printing is going through a bit of Wild West phase. There are competing standards, users who will passionately defend their brand of choice and devices that look like they should be in tl engineering bay of a starship, not your home.

So what's someone new to 3-D printing to do? Consider these 3-D printer models as a starting point, do some research to make sure it's right for you, then take the plunge. After all, what's the point of being present in your own sci-fi future if you're not willing to take a few risks?

FDM Printing: Original Prusa i3 MK3 Kit

Prusa 3D Printer with Multi Material Upgrade PRUSA

Designers that rely on 3-D printing as part of their livelihood use Prusa printers to turr out consistent, quality results. These kits (also available as preassembled and tested printers) contain expertly chosen parts, with an eye on recent technological upgrades. Fused Deposition Modeling (or FDM printing) deposits thin layers (or "slices") of extruded filament, based on a 3-D design, building up a model bit by bit. Prusa's kits ar expensive, but that's because you're not getting a factory knockoff that's built with last-gen parts. You can even get a multimaterial upgrade kit that allows you to print in five different colors (rather than just a single color at a time). If you want to dive deep into , D printing, why not start with a printer that the pros use?

Shop Now

SLA Printing: The Prism Desktop 3D Printer

Prism Desktop 3D Printer PRISM

With an auto-leveling bed, on-the-fly cure adjustments, and built-in resin calibration, the Prism Desktop 3D Printer is meant to appeal to experts and new users alike. Stereolithography (or SLA printing) works similarly to FDM, in that your print is creat from slices of a 3-D model. In this case, however, the print is created from the top dow as your model is lifted out of a resin bath and cured to harden. It creates prints that are more durable and more detailed, needing less cleanup of the print after the fact. The al metal Prism printer is wireless, accepting input from more slicer software than its competitors, allowing you to work with whatever you're most comfortable. The Prism does all this in a device that's substantially more affordable than anything else on the market. Shipping later this year, it's worth backing now. You'll get a top-of-the-line 3-I printer for the same price as it would take to get a couple of bottles of resin from other established SLA printer companies.

Shop Now

ELEGOO Mars UV Photocuring LCD 3D Printer

ELEGOO Mars UV ELEGOO

If you're looking for a SLA printer that you can buy right now, you can get this ELEGO(Mars UV model from Amazon for even less than the Prism. It comes with its own slicin software, allowing you to hollow out 3-D models - great if you're trying to save a bit on your resin costs. It uses 40W UV lights to quickly cure printed models and can be used offline via the 3.5-inch touchscreen. They even have a model pre-loaded into the ELEGOO so that you can start your first print within five minutes of unboxing the printer.

Shop Now

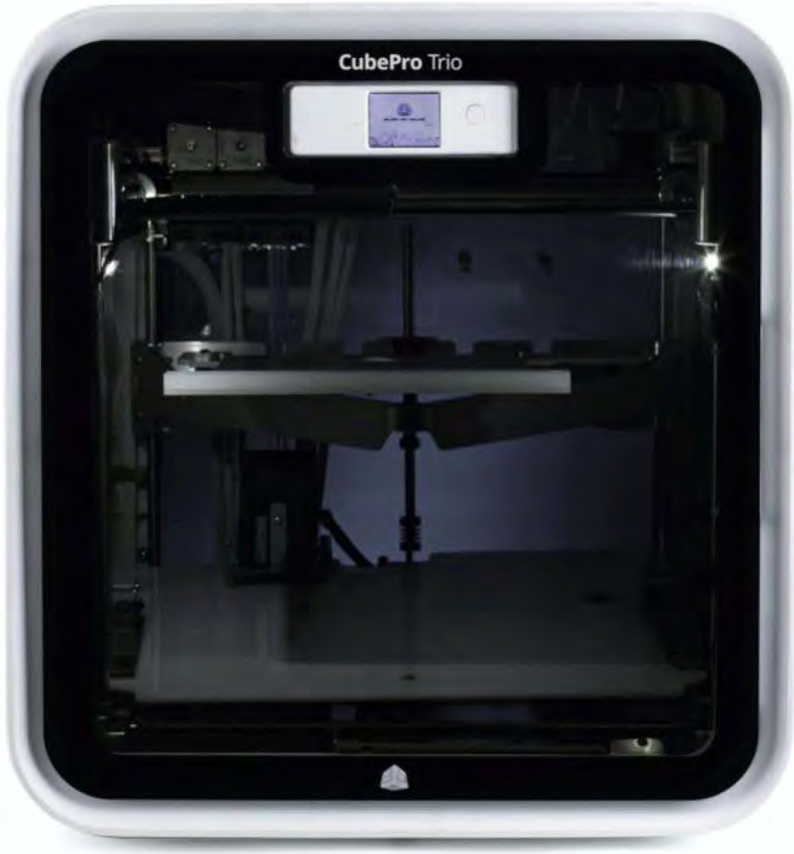
FlashForge Creator Pro 2017

FlashForge Creator Pro 2017 AMAZON

If you're looking for a decent 3-D printer that sits between budget printers and high-en ones, then look no further than this offering from FlashForge. The company has been i the 3-D printing game for a while now, and it shows. You'll get an easy-to-use interface along the ability to work with both ABS and PLA filament, making it more versatile tha some other options.

Shop Now

CubePro Trio



CubePro Trio AMAZON

Perhaps you want to bring your 3-D prints to the next level, in which case it's worth checking out the CubePro Trio. This 3-D printer can print in three colors at a time, and even three different materials — which can come in handy if you want to print something enclosed. This printer is perfect for engineers and modellers who want to create something with moving parts.

Shop Now

"3-D" Printing: Glowforge

Glowforge GLOWFORGE

When is a 3-D printer not a 3-D printer? When it's a top-of-the line laser cutter/etcher that lets you create objects. While Glowforge is definitely reaching a bit by calling itself 3-D printer, I think it's an amazing product in its own right. With laser-precise cutting, you can create a staggeringly wide array of items—from party favors to board game components to personalized laptop covers. Although the Glowforge process is more aki to whittling or carving than it is to 3-D printing, I find the things that you can make wi Glowforge even more versatile and useful for everyday living. I've built several board game storage components using Glowforge-printed parts and I came away impressed a the fit and finish. Plus, if you work with plywood (you can also create prints from leath or acrylic), your finished product smells like wood instead of plastic. And that's something I'll always support.

Shop Now

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Anthony Karcz

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I've been writing about technology, gadgets, and pop culture back before Apple had even thought o the iPhone. I've seen the rise and fall (and rise again) of Apple. I'... **Read More**

Is Prusa's i3 MK3 The Tesla of Under-$1000 3D Printers?

Ian F. Darwin Follow
Jan 25, 2019 · 10 min read ★

There are lots of 3D printers on the market — so many that it's probably ripe for a market contraction. And this article is just looking at desktop FDM printers, those that use a spool of plastic, basically a carefully-controlled hot-glue gun that can move in 3 axes. There are low-cost units in the $200–300 range. There are mid-scale printers around $1000. And there are high-end consumer 3D printers around $2,000–3,000. In the resin and metal-deposition printers, there's basically no upper bound on the cost. And there are (much larger!) concrete-deposition printers used to build houses quickly — that's a whole other article.

Josef Průša is a well-known contributor to the original RepRap 3D printer project, the original "self-replicating" printer project, founded by Adrian Bowyer and still very active at https://reprap.org/. RepRap was the first open-source and open-hardware DIY project to build 3D printers. Josef has taken what he learned there and mixed it with a lot of skill and energy to drive Prusa Research into a very successful company making and selling their own 3D printers. The Original Prusa i3 MK3 is their latest and greatest, and great it is, not the least because of the optimizations built into it, the fact that the firmware and desktop software is both open source and constantly updated, the range of add-ons including multi-color printing, the great instructions that come with the device, and the fact that you can buy it in kit form if you need to save $250 or if you just want to really know what's inside it. Actually I lied about the "latest and greatest" part. The i3 Mk3 is no longer their latest — I'm happt to announce that they now have a resin printer too, the Original Prusa SL1 Open-source MSLA 3D printer. But this is so new it's only available to pre-order (as of February, 2019), and it's for a later review.

Does it seem a bit audacious to call the Original Prusa i3 "the Tesla of 3D printers"? But that's what it is. Tesla is the startup electric car company that both dragged the whole rest of the existing automotive industry from the dark, smoky age of combustion engines to the clean, quiet, efficient age of electric cars, and prompted dozens of startup companies to enter the same market with lower-cost products. Prusa has done the same: dragged a lot of companies into clean, quiet, efficient 3D printing, and prompted a lot of low-cost competition —that's that $200–300 range I mentioned earlier. That price point, by the way, is a minefield — there is some real rubbish out there, but you can also find decent stuff *if* you shop carefully. Tesla and Prusa also share a culture of continuous improvement — Tesla firmware is frequently updated "over the air" just like your smartphone, whereas Prusa provides free updates which you can download and "flash" into your printer at any time. Prusa has even had their own version of "manufacturing hell" on a much smaller scale. As Josef wrote about the powdered-steel bed plates which make the printed object easier to remove: "Powder coated sheets manufacturing is a never-ending story. It's incredibly difficult to manufacture them in high quantity, while keeping great quality."

BTW, what's with all the "Original Prusa" captioning? It turns out that Josef Prusa is so well-known and respected in the printing world that all the cheap knock-off printers feel obliged to appropriate his name. Just search on any other shopping site for "Prusa", and you'll find that most of the ones that say "Prusa" are not from Prusa Research, they're just using his name. Too bad Josef never trademarked his own name. But then he probably wouldn't; he prefers to get ahead by having a better product line instead of fighting it out in court. The Tesla analog of this, btw, is certain mainstream auto press writers stupidly calling every new EV concept car a "Tesla Killer" (concept cars are what you think: vaporware, possibly one working hand-made prototype, sometimes even a non-working prototype at a car show). Car journos have been saying that for a decade and Tesla's still going strong.

Why Buy The Best? Why would you not?

Prusa i3 Mk3 Printer

So if you can buy a usable printer for $300, why should you buy the Prusa 3D at $750 (kit) or $999 (assembled)? Let me count the ways!

Constant innovation driven by the company and by the large community: new features get added. Some like the MMU you have to buy, but others you can 3D print for yourself — The printer is open source so you can print replacement or improved parts — and software improvements are always free. Constant information provided by blogs from the company, such as this one on how to be sure your new i3 kit is assembled and set up correctly. Constant research into filaments (realizing they couldn't depend on other manufacturers for top quality, they now blend, use, and sell their own filament, modestly named Prusament), research into ongoing problems and solutions, and more.

Basic features that work: My first 3D printer — like many in the lower price range — lacked a heated bed and was designed in such a way that it was incredibly complicated to manually level the bed, so I had a lot of adhesion problems (getting the model to stick to the bed). The i3 includes a heated bed that is self-leveling. The i3 also has a removable bed plate (shown magically suspended mid-air in the above photo from prusa.com; it is of course flat on the table at the bottom of the machine when in service) that makes it easy to remove the finished model from the bed, just by flexing the plate. So many pain points salved over!

Custom firmware: instead of just using the original RepRap firmware, Prusa has extensively re-written it. Just one example: the i3 has a *Belt Status* indication that tells you if the belts that pull the print head are at the right tension. Too little or too much tension will cause printing problems. Of course the belt tension will be pre-set correctly on factory-assembled units, but on the kit you need to be sure it's in range, and anyway, it can change over time if the belts stretch or if anything comes loose, so it's great that they build in the self-test. I don't know of any other under-$1,000 printer that does this.

A pair of additional ***save-your-butt features*** are "power panic" and "filament sensor." Filament-based 3D printing is *slow*. Two of the worst things that can happen are running out of filament and running out of electricity. With many lesser printers, either of these results in the print being wasted — all that filament lost — and having to start over — all that time lost. Power Panic works by having the software remember where it was in the print and, after coming back from a power-off situation, asking if you want to resume from where you left off. Filament sensor, of course, notices when you run out of filament, pauses, and lets you continue after loading more filament. Both vital features!

But wait: there's more! The Prusa i3 also detects "layer shift," when one layer of the print is not in the correct position relative to the next, and automatically corrects it.

And, to top it all off, they provide a Prusa-customized version of Slic3r, the software that converts from generic "STL" (stereolithography) files — the output of CAD programs — into Gcode, the graphics language used by most 3D printers, and also sends them directly to your Prusa printer.

Sound: 3D printing can be noisy. The fans make noise, and the motors moving the nozzle around make noise. Fan noise makes some people drowsy. Premium components and good design reduce noise. The low-cost printers are loud — I measured the sound level while printing on one. In my house with hardly anything running, background level is about 18 dB. The cheap printer raises that to about 35dB (both measurements made with a smartphone app at a distance of 1 foot or 1/3 meter from the hot end fan). Sound is measured on a logarithmic scale, on which every 10 dB increase in the reading means you have 10x the noise. The Prusa i3 has two modes, normal and stealth. Even in normal mode it claims to be quieter than 90% of printers. In stealth mode it slows down a bit, but the noise level drops to an almost-unbelievable level.

Safety: While the cheaper imitations have a tendency to catch fire, the real Prusa has three fuses (standard automotive fuses, available at any auto supply store) on the main board, and software to notify you which one blew in the unlikely chance that one of them does. There's even a thermal sensor on the main board that will tell you if the board is overheating, which almost always means that a wire to one of the two heating elements isn't connected securely. That's taking safety seriously!

Ongoing support: the company sells spare parts for its printers, and offers technical support. Starting with the New User Guide page, you will be given some guidance and lead to a detailed introductory book, blogs, community support, as well as online chat support and email support for owners, something you will usually not get for free from the cheap knock-off manufacturers.

Not only that, to avoid obsolescence, they sell upgrade kits! If you own an i3 MK2 or MK2.5, you can buy a kit of the new/changed parts and upgrade your machine to become an MK3. When they come out with the MK4, you'll presumably be able to buy an upgrade the same way. If you have the two-color MMU, you can buy the parts to convert it to the five-color. It's as though Ford or GM would sell you the parts to convert your 2015 Taurus or Cruze into a 2018 model — you know that's *never* going to happen before the Sun goes nova and toasts all those little sedans into cosmic dust. But Prusa does it, now, at reasonable prices.

> *Here's a fun fact for free: Prusa Research "eats its own dog food", that is, it uses Prusa i3 printers to make* **all** *the plastic parts for Prusa i3 printers! And not just a few — they have* ***450*** **printers running non-stop** *making those parts to keep up with the demand!*

What I learned by kit-building

First, why build from a kit? Especially at the high end, there is a tension between taking the time to put the thing together like the factory does, and just getting on with using it. Part of the essence of being a "maker"-type person is understanding how things work, and putting all the pieces into place will definitely help you understand in more detail how your 3D printer works. On the other hand, if you're really in a hurry to get started and don't mind spending $250 to have the factory install and test your printer, or you need the greater warranty, or you're buying a bunch of printers at the same time, you can order your Original Prusa i3 unit(s) fully assembled, and be printing while some of us are still adjusting belt tension and such like.

I've built one other 3D printers from a kit, the low-cost (almost embarrassed to say the name) "ElecFreaks" printer. I fell for it on Kickstarter because it is so small and portable. I learned from my multiple mistakes in building it — a belt routed over a pulley instead of under, another belt joined too loose, a bolt not tightened enough, and so on. To call the ElecFreaks instructions sparse would be like, well, true. So, figuring out how the parts actually go together was part of that education! And, because it does not have a heated bed (Prusa does) and is a bugger to level the printing bed (something the i3 does automatically), it took forever to get started making actual prints with the ElecFreaks, though I loved the form factor.

The process of building the Prusa i3 from a full kit is as different from the ElecFreaks as day is from night, because Prusa provides a *very detailed* guide on every step of assembling their printer. Unfortunately I didn't build the Prusa kit, as I wasn't able to obtain the kit in time for this review. Maybe later!

Conclusion

If you're looking for the best mid-range printer in the sub-$1000 category, the Prusa i3 Mk3 is probably your best investment. And that's not just my opinion: on their homepage, Prusa Research lists awards from Make Magazine, All3DPrinting, and others.

Where to buy: You can always buy direct from Prusa Research in Prague, Czech Republic, at https://shop.prusa3d.com/. However, you may wish to buy locally if there is a dealer in your area, for support: it's nice to have someone to ask those basic questions of, especially if you are building it in kit form or just in case there's a problem with your printer. One Toronto dealer bundles a coupon for their seminar on how to build your 3D printer — select the Prusa i3 kit to view this. There are also Facebook groups, both for general 3D printing and these two (one with 23,000 members, one with

11,000 members) for "Original Prusa i3" owners. And Meetup Groups, local user groups, etc.

All prices in USD, may not include shipping, and all specs are subject to improvement without notice.

Update — February 2019

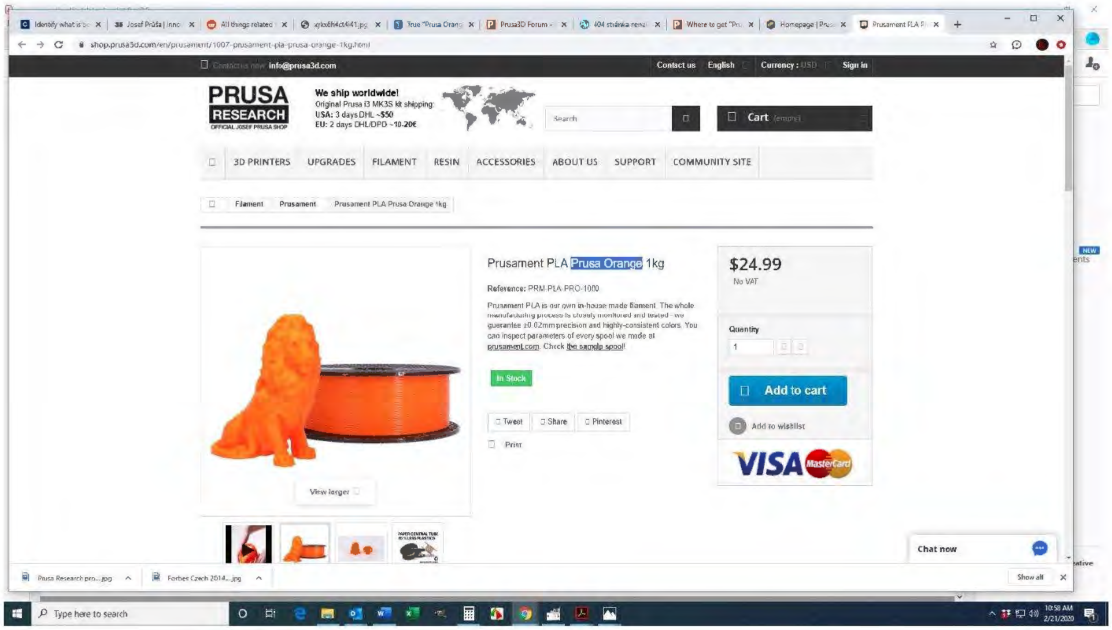
In mid-February of 2019, Josef Průša himself took to the blogwaves to announce a series of updates to the i3 — now the MK3S — to improve reliability and serviceability. As is typical, these improvements did not affect the price of the current i3 (i.e., US$749 kit/$999 assembled now gets you the MK3S instead of the MK3) and are available quite inexpensively for owners of the existing MK3 (free for those who bought in the last two weeks, US$20 for the metal parts; you can print the plastic parts or buy them for an additional $20). There's also an update to the "MMU" (multi-material or multi-color printing) which is *free to all owners of the MMU*, as there were many problems with the MMU's serviceability. Numerous other upgrades too — read the blog post cited above to see them all.

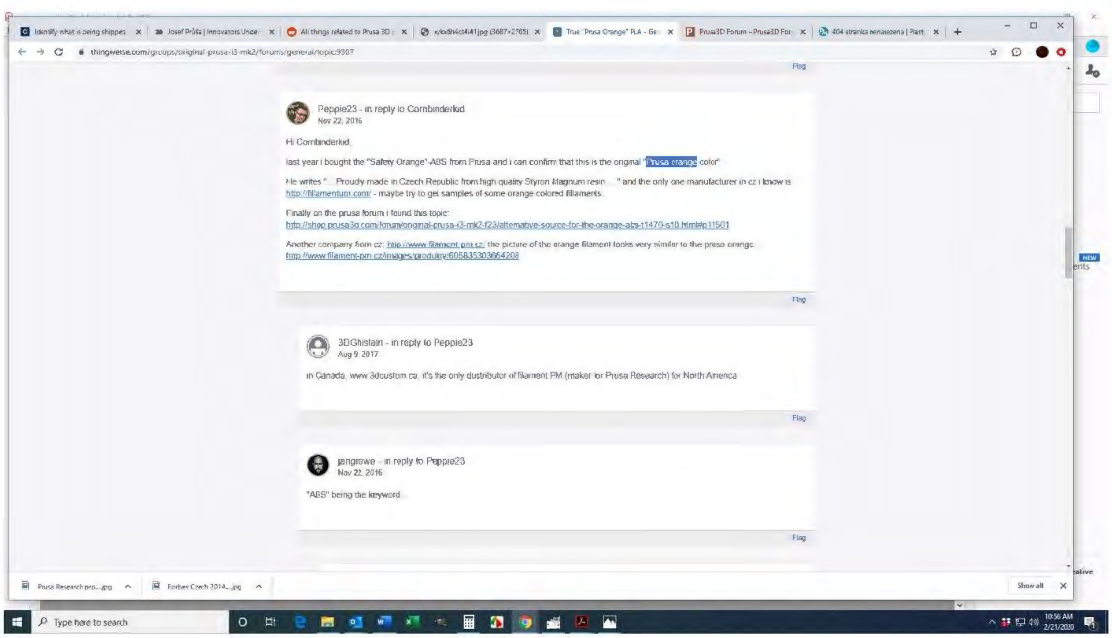
About the Author

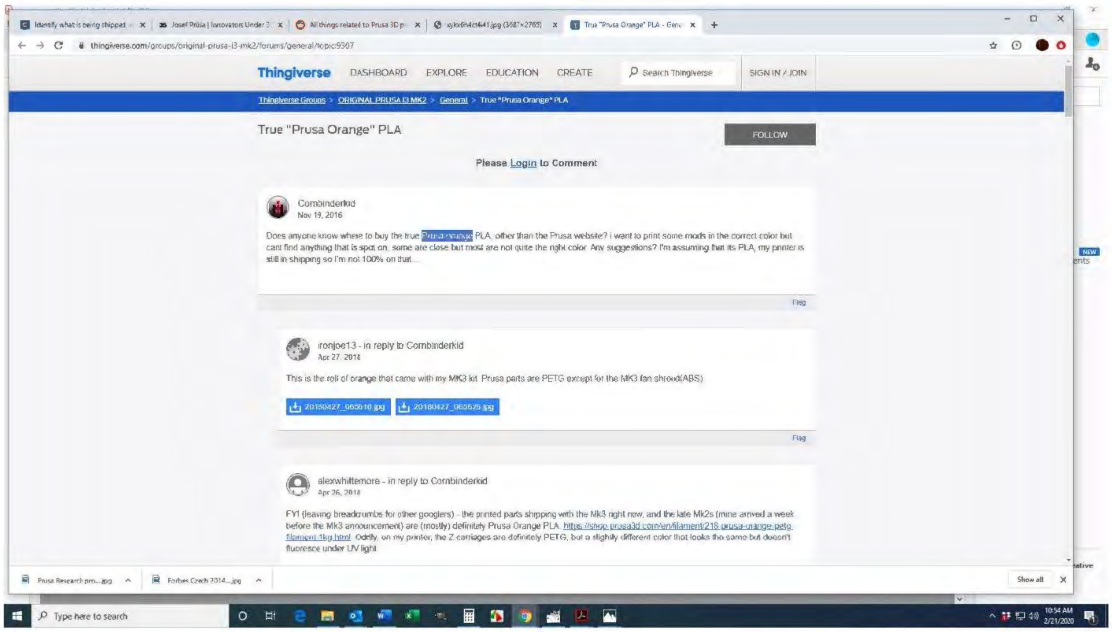
Ian Darwin has used, owned and built various electro-mechanical devices including 3D printers. Before 3D printing he did some woodwork and metal work using old-school tools such as hand planes, hand and power saws, lathes, milling machines, drill presses. In the early days of the PC era, he built several computers from bare circuit boards, and keeps his soldering iron handy. In addition he's been successful as a software developer and instructor (on a wide range of computers culminating in modern mobile apps), computer book author, technology reviewer, the parent of three, and long ago, a SCUBA diving instructor.

Prusa I3 Josef Prusa 3d Printer Review 3D Printing

Screen captures of data related to the use of PRUSA ORANGE, in support of the acquired distinctiveness of PRUSA under Section 2(f):






thingiverse.com/groups/original-prusa-i3-mk2/forums/general/topic:9307
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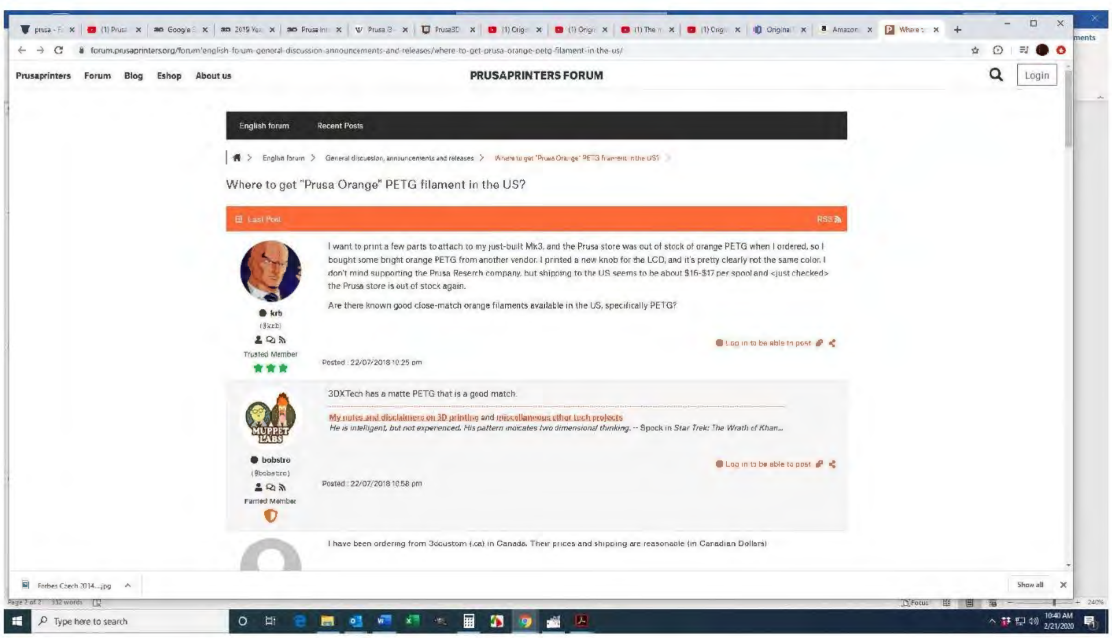
EDUCATION
CREATE
Search Thingiverse
SIGN IN / JOIN
Thingiverse Groups > ORIGINAL PRUSA I3 MK2 > General > True "Prusa Orange" PLA
True "Prusa Orange" PLA
FOLLOW
Please Login to Comment
Combinderkid
Nov 19, 2016
Does anyone know where to buy the true Prusa orange PLA, other than the Prusa website? i want to print some mods in the correct color but cant find anything that is spot on, some are close but most are not quite the right color. Any suggestions? I'm assuming that its PLA, my printer is still in shipping so I'm not 100% on that...
Flag
ironjoe13 - in reply to Combinderkid
Apr 27, 2018
This is the roll of orange that came with my MK3 kit. Prusa parts are PETG except for the MK3 fan shroud(ABS)
20180427_065616.jpg
20180427_065626.jpg
Flag
alexwhittemore - in reply to Combinderkid
Apr 26, 2018
FYI (leaving breadcrumbs for other googlers) - the printed parts shipping with the Mk3 right now, and the late Mk2s (mine arrived a week before the Mk3 announcement) are (mostly) definitely Prusa Orange PLA. https://shop.prusa3d.com/en/filament/218-prusa-orange-petg-filament-1kg.html. Oddly, on my printer, the Z carriages are definitely PETG, but a slightly different color that looks the same but doesn't fluoresce under UV light.
Type here to search


forum.prusaprinters.org/forum/english-forum-general-discussion-announcements-and-releases/where-to-get-prusa-orange-petg-filament-in-the-us/
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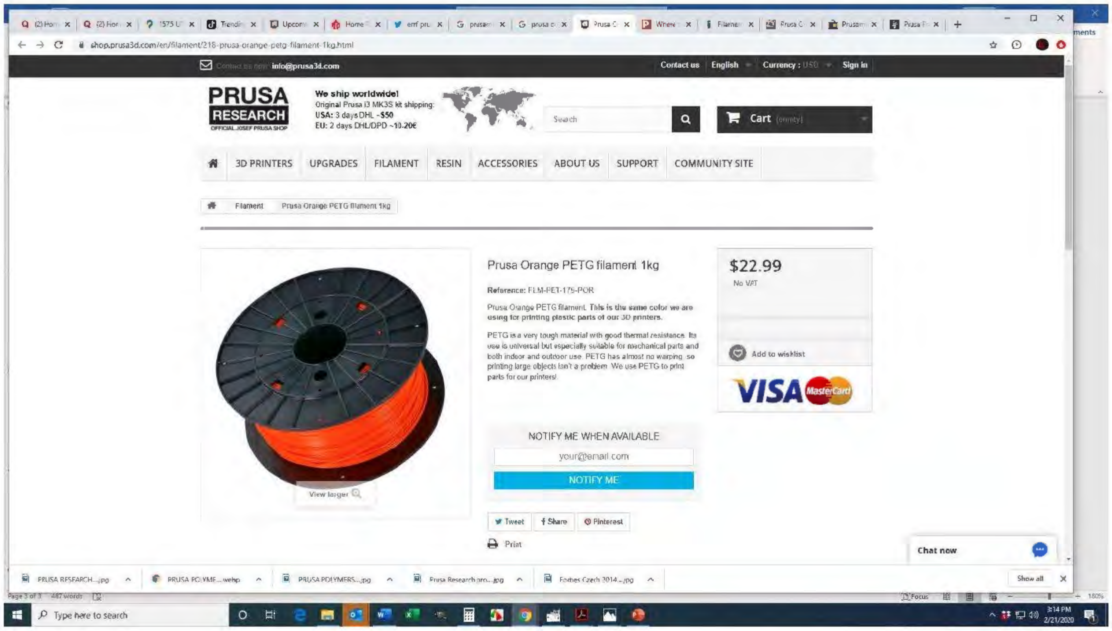
English forum > General discussion, announcements and releases > Where to get "Prusa Orange" PETG filament in the US?
Where to get "Prusa Orange" PETG filament in the US?
Last Post
RSS
I want to print a few parts to attach to my just-built Mk3, and the Prusa store was out of stock of orange PETG when I ordered, so I bought some bright orange PETG from another vendor. I printed a new knob for the LCD, and it's pretty clearly not the same color. I don't mind supporting the Prusa Reserch company, but shipping to the US seems to be about $16-$17 per spool and <just checked> the Prusa store is out of stock again.
Are there known good close-match orange filaments available in the US, specifically PETG?
krb
(@krb)
Trusted Member
Log in to be able to post
Posted : 22/07/2018 10:25 pm
3DXTech has a matte PETG that is a good match.
My notes and disclaimers on 3D printing and miscellaneous other tech projects
He is intelligent, but not experienced. His pattern indicates two dimensional thinking. -- Spock in Star Trek: The Wrath of Khan...
MUPPET LABS
bobstro
(@bobstro)
Famed Member
Log in to be able to post
Posted : 22/07/2018 10:58 pm
I have been ordering from 3dcustom (.ca) in Canada. Their prices and shipping are reasonable (in Canadian Dollars)
Type here to search


shop.prusa3d.com/en/filament/218-prusa-orange-petg-filament-1kg.html
info@prusa3d.com
Contact us
English
Currency : USD
Sign in
PRUSA RESEARCH
OFFICIAL JOSEF PRUSA SHOP
We ship worldwide!
Original Prusa i3 MK3S kit shipping:
USA: 3 days DHL ~$50
EU: 2 days DHL/DPD ~10.20€
Search
Cart
3D PRINTERS
UPGRADES
FILAMENT
RESIN
ACCESSORIES
ABOUT US
SUPPORT
COMMUNITY SITE
Filament
Prusa Orange PETG filament 1kg
Prusa Orange PETG filament 1kg
Reference: FLM-PET-175-POR
Prusa Orange PETG filament. This is the same color we are using for printing plastic parts of our 3D printers.
PETG is a very tough material with good thermal resistance. Its use is universal but especially suitable for mechanical parts and both indoor and outdoor use. PETG has almost no warping, so printing large objects isn't a problem. We use PETG to print parts for our printers!
$22.99
No VAT
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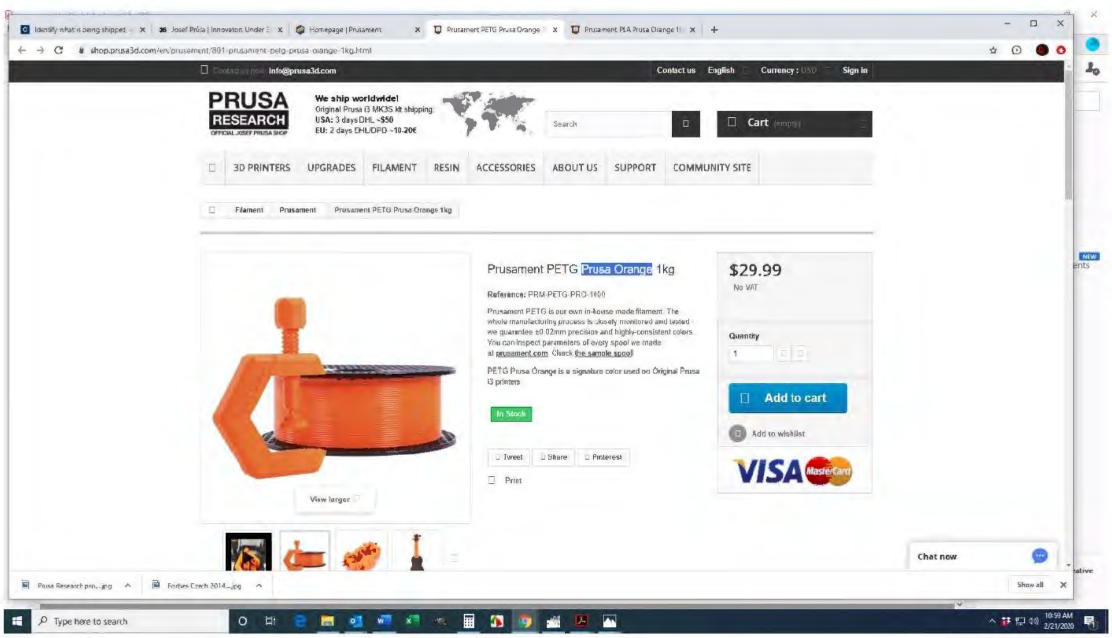
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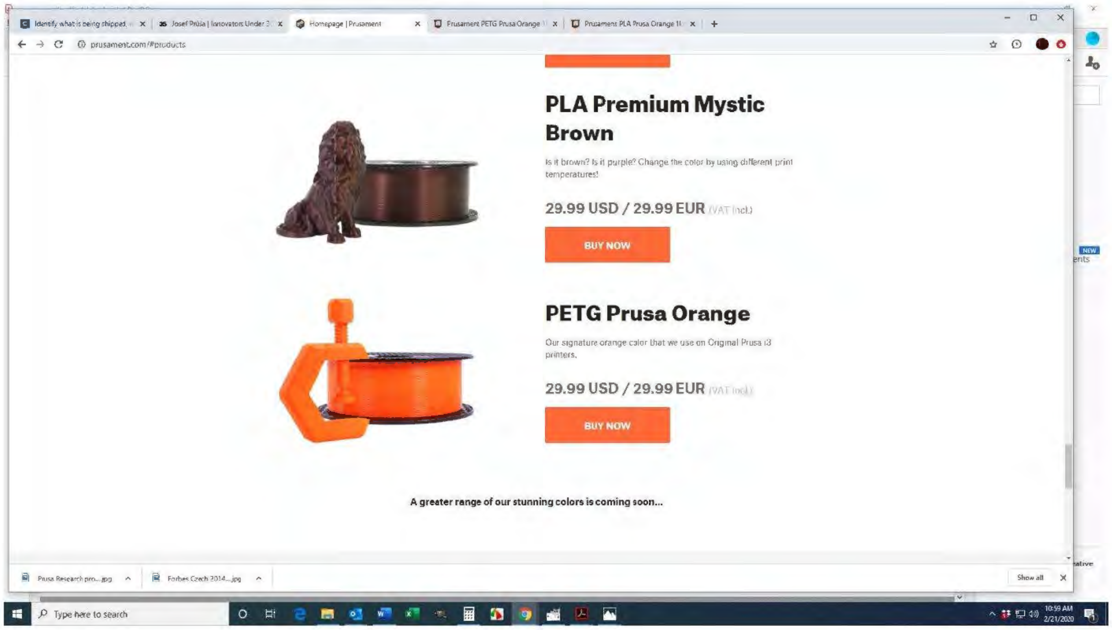
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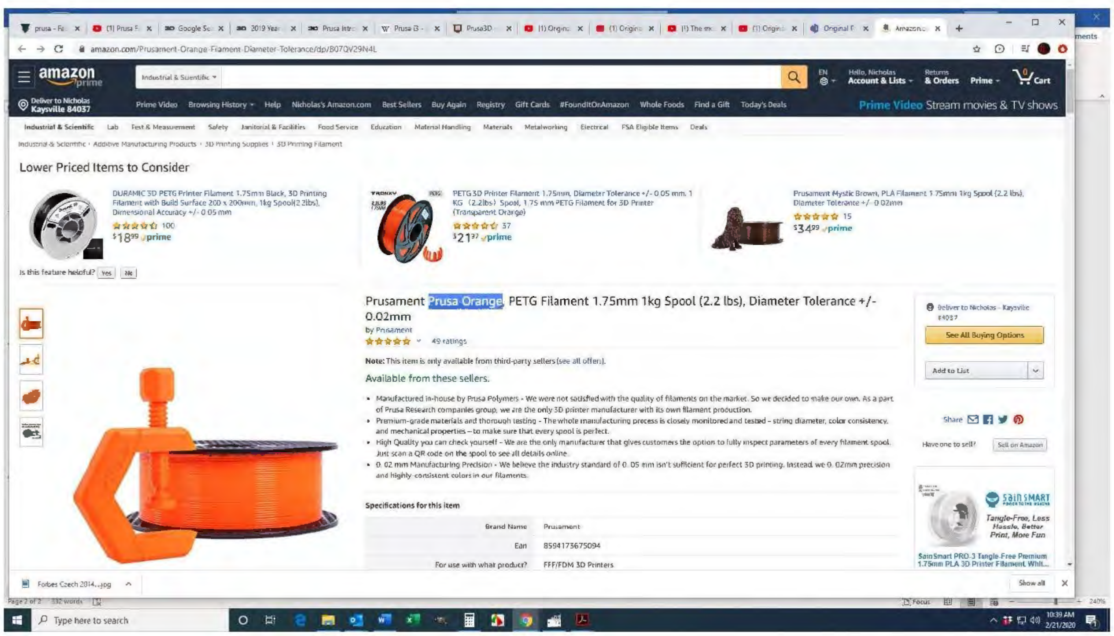
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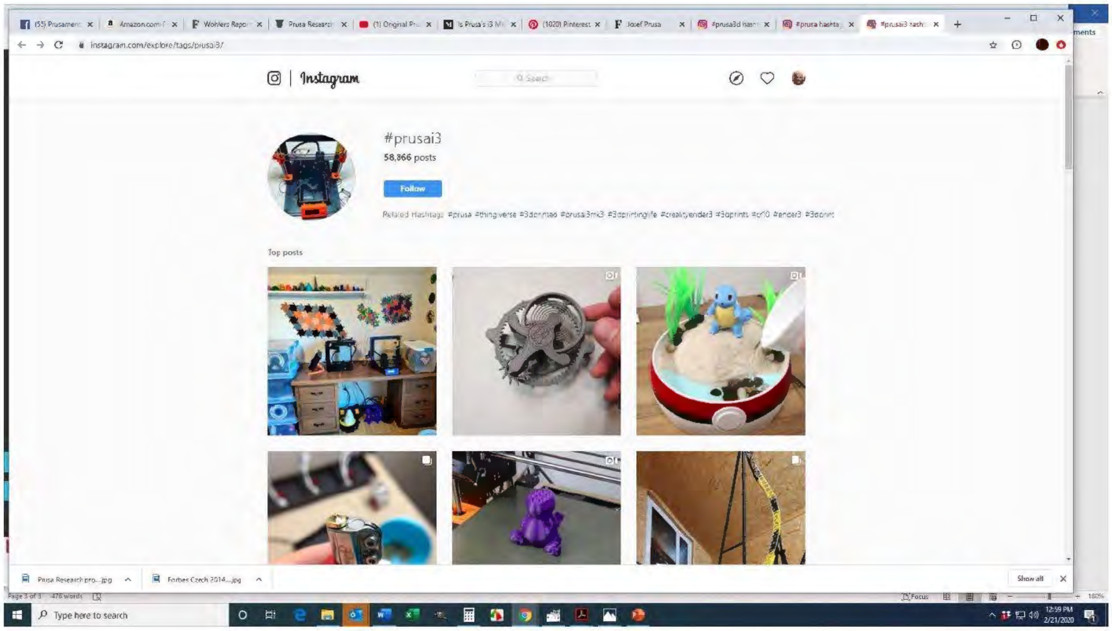

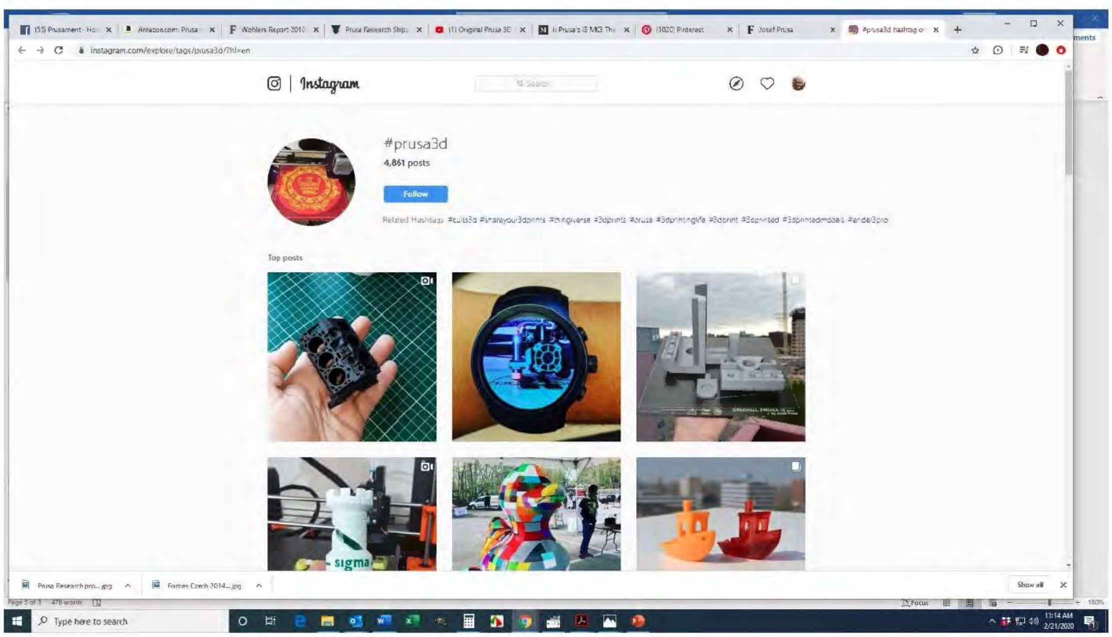

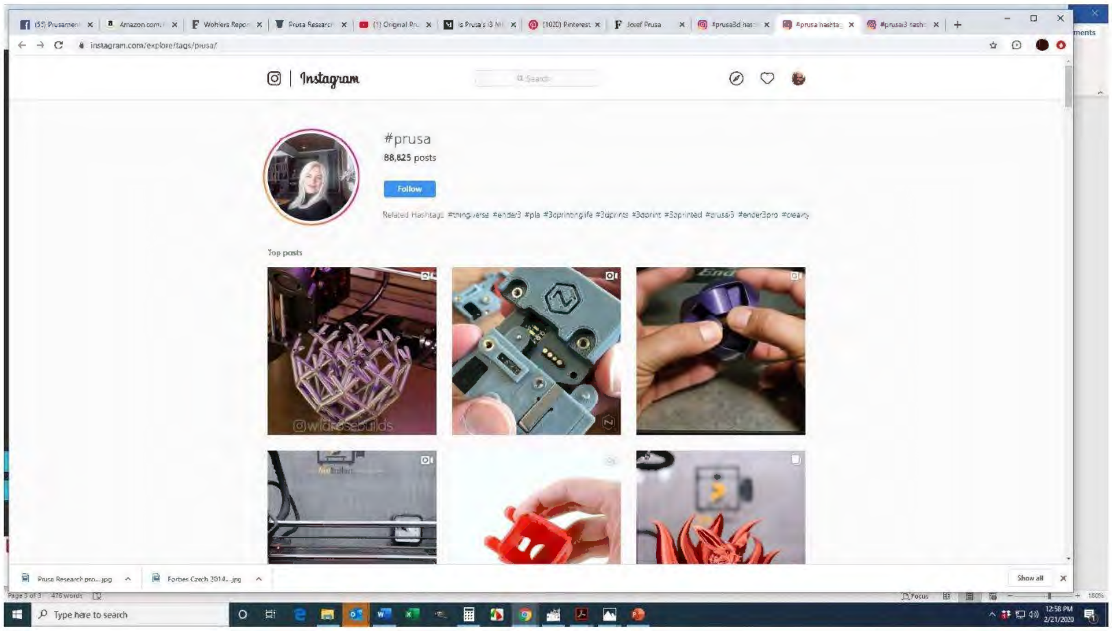
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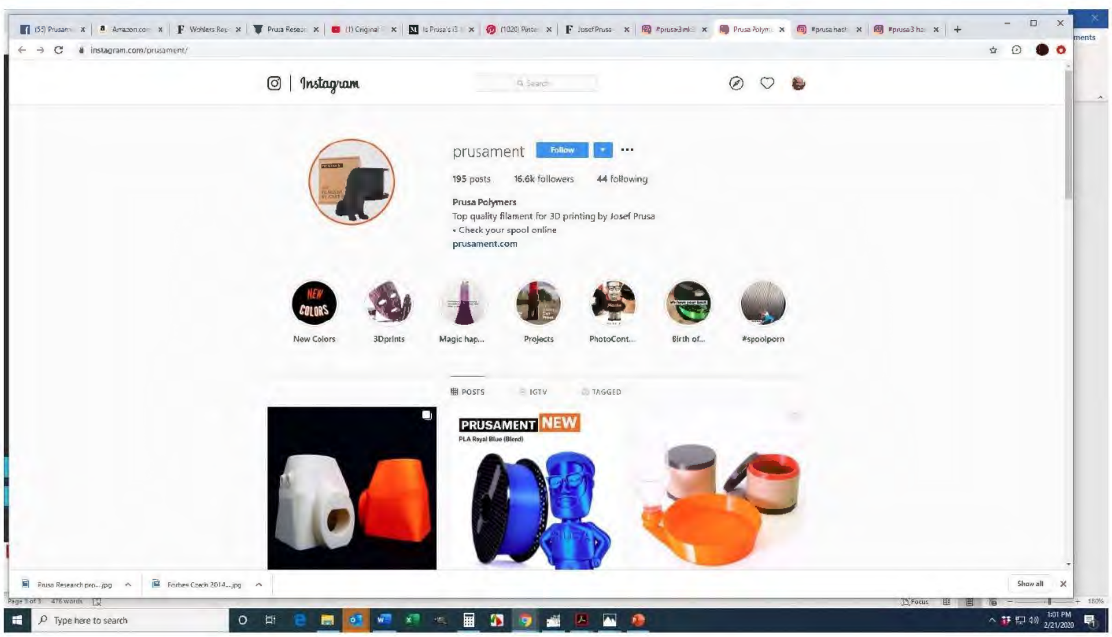
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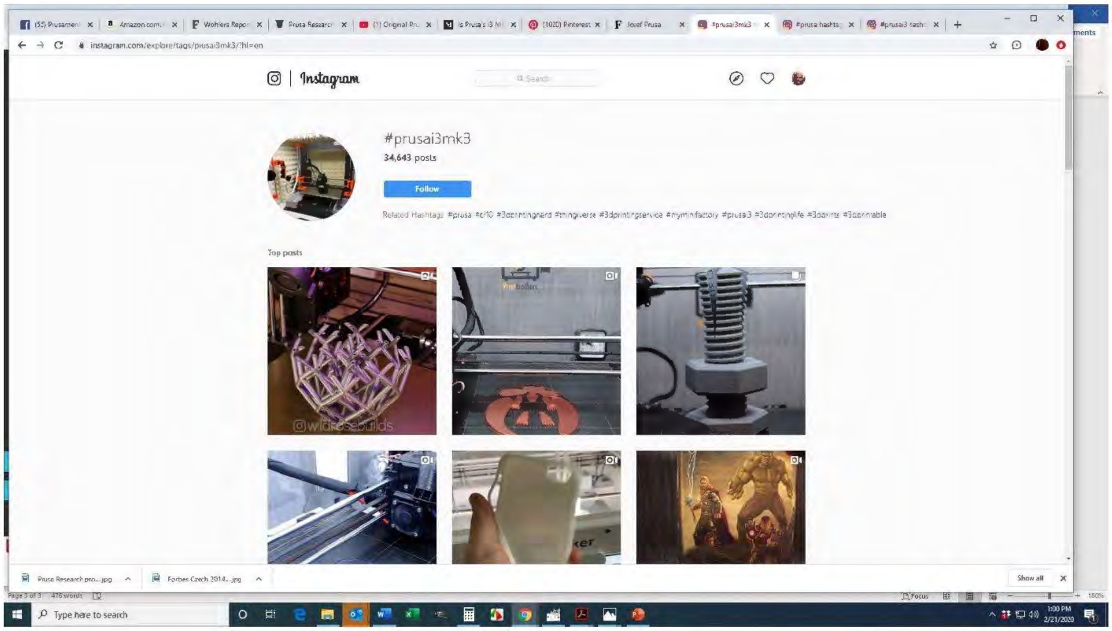
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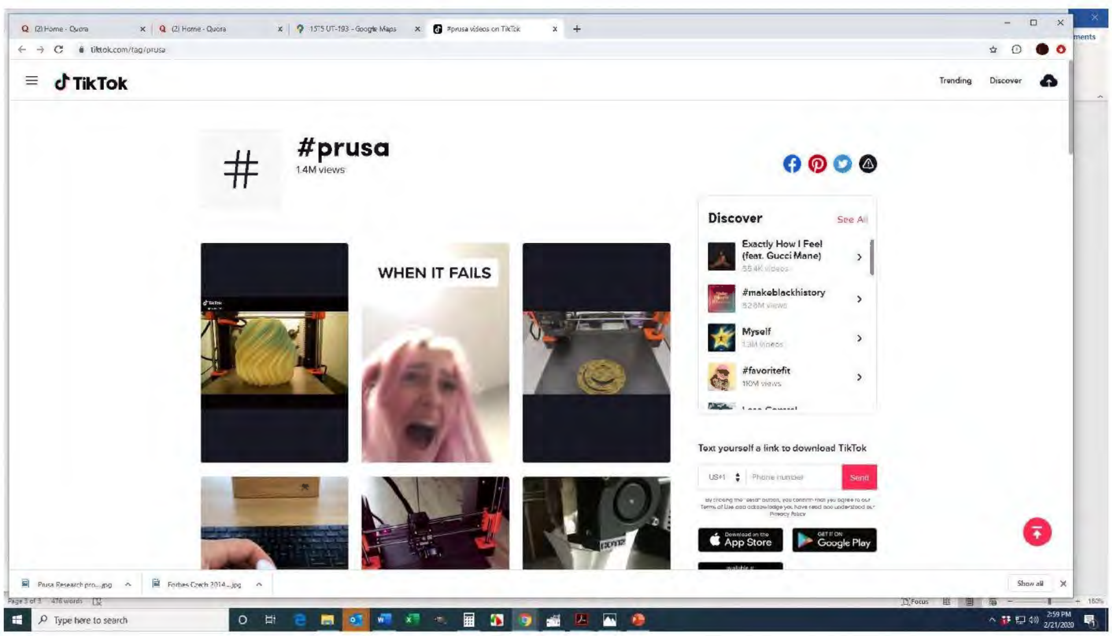
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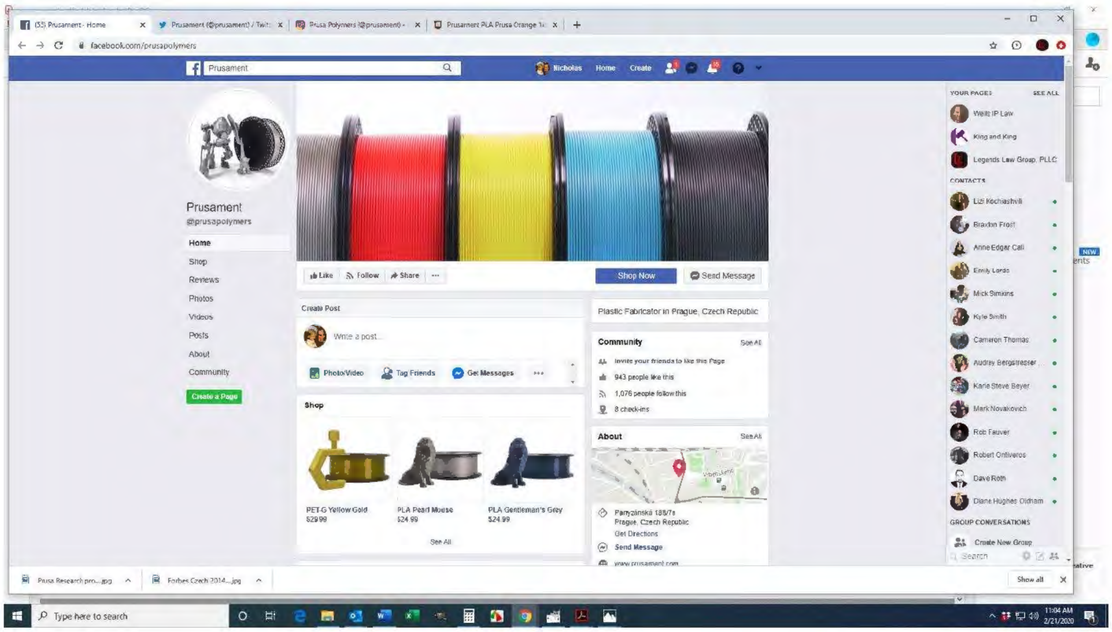

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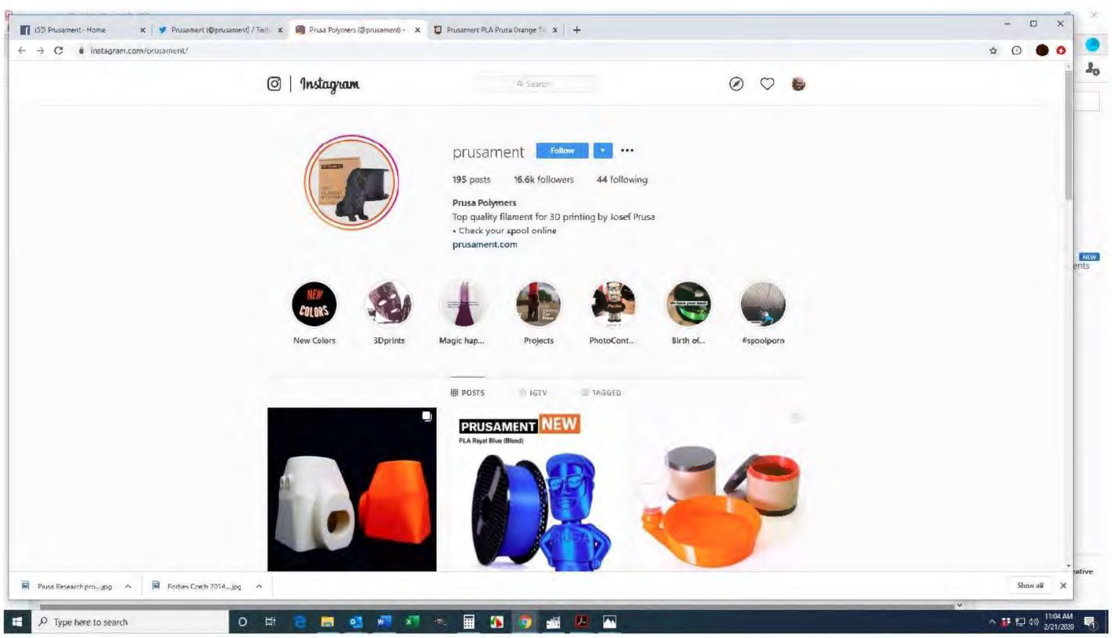

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Original Prusa i3 MK3S review

How does the latest version of Prusa's 3D printer stack up against the competition?

By Ali Jennings

May 31, 2019

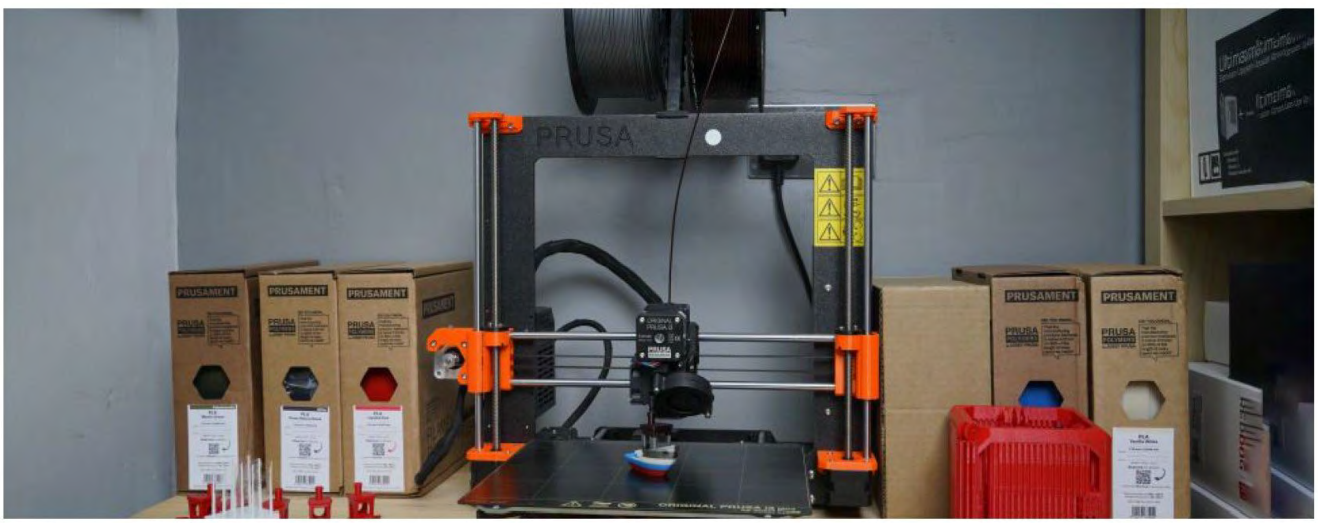

Image credit: TechRadar

(Image: © Image credit: TechRadar)

OUR VERDICT

No other 3D printer comes close to the Original Prusa i3 MK3S's balance of features, quality and price. There are options to buy as a kit or as an expert built ready to go machine. Whatever way you decide to buy, there's no doubting the quality of the M3KS and the prints it produces.

FOR

Quiet

Easy to remove prints

Upgrade options

USB or SD

AGAINST

Open print platform

Single filament as standard

Home built design

Introduction, design and features | Performance and verdict

Today if you talk about 3D printers then there's one company that stands out from the rest, and that's Prusa Research.

It's founder Joseph Prusa, who gives the company its name, is not only the brain behind the operation but also the figurehead, and a common sight on the 3D printing circuit.

What he and his company has managed to do is to bridge the gap between the Open Source community and commercial enterprise.

- Prusa Original Prusa i3 MK3S at Prusa for $999.99

Prusa, the man and machine, do things differently with tweaks and innovation at the core of the technology. That means that if you invest in a model today, there's a high likelihood that it can be upgraded in the future, as all Prusa machines before have done.

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The new printer, Original Prusa i3 MK3S, like the previous generations is available in a selection of formats, free as printable parts and a shopping list, as a kit that you build yourself or as an expert built system that can be unboxed and is ready to use.

I've built a few in the past, and this time Prusa has sent the factory-built version. I have to say the quality of finish, especially with the wiring routing, is a world apart from my usual wiring mess.

One observation from the outset is that the Original Prusa i3 MK3S while being the latest iteration of the printer looks much the same as previous generations, it's only under closer scrutiny that you realise that it's a very different beast.

I'm looking at the S model, which is a minor update to the MK3, so this review relates to the Original Prusa i3 MK3 with the S update.

One aspect that has made the Prusa machines so popular is the open design, you can download the parts and print, buy in a kit or purchase the expert build (Image credit: TechRadar) (Image credit: Image credit: TechRadar)

Design

3D printers as they stand are not design classics. While the 3D print technology has bounded along the product design hasn't. Although there are a few manufacturers such as the Cel-Robox and MakerBot who have got product designers involved in the aesthetics.

Part of the reason is that the 3D community likes to tinker, and the industry has grown from the Open Source community. Prusa of all the companies has stayed close to the original community and still feeds much of the research and development back.

As such, the MK3S, as with previous generations, has an open design and look. It wouldn't look at all out of place in a garage or workshop and looks less at home in a style-conscious design studio.

Looks can be deceptive, and you shouldn't underestimate the design - the Original Prusa i3 MK3S is one of the best printers on the market when it comes to print quality, but it's also the most versatile if you're prone to a little tinkering.

The printer is there to use, develop, enhance and make your own; the Prusa is the only widely available printer left that enables you to do this.

Features

Let's take a look at what makes the Original Prusa i3 MK3S a little different from the vast majority of other printers.

Firstly there are the options, parts for the printer can be printed from files downloaded from the Prusa site and then with a bit of time and effort you can collect together all the bits you need to build your own.

It's dubious if you'll save yourself any money, but if you're at a loss for a project, then it's a good challenge and more than possible.

The fact that there is a kit option is one of the most prominent features; it's what got me and so many others into 3D printing in the first place. Build it, and you can see how it works.

I've now built and designed my own 3D printer so having one turn up pre-built is a huge plus point for me but knowing that I can tinker at some point, which I inevitably will, I can upgrade the extruder if there's a need, mess with the firmware, and well, that's all part of the fun.

What's new

Although the MK3S looks much like the MK2 and original, there are some significant differences, and the MK3S has been designed and upgraded based on user feedback. The S model is a slightly souped-up version of the MK3.

The Extruder has had a few design tweaks over the previous version that make it easier to use and service, Prusa has also addressed a minor issue with resonance. This issue has been overcome by shifting the nozzle closer to the X-axis which along with the upgraded fan helps to improve print quality.

The upgraded extruder is now easier to use and maintain than previous versions and features the outstanding E3D V6 hot-end (Image credit: TechRadar) (Image credit: Image credit: TechRadar)

Another enhancement is the hybrid filament sensor; this combines a mechanical switch and optical sensor. This gets around issues that were caused when printing with transparent and some reflective filaments. The optical and mechanical sensor used in combination improves reliability when these filaments are loaded and ejected.

Notable features

These new features may seem small but join those improvements that were already rolled out with the MK3, and these were far more significant.

The Original Prusa i3 MK3S is one of the cheapest 3D printers on the market when it comes to a balance of print quality and reliability. The design has a lot to do with it, but there's no scraping on the quality of the parts.

E3D Hotend: This use of quality parts is highlighted by the E3D nozzles. Designed by a team in the UK these all metal hotends are known to be about the best in the industry and are widely used. The MK3S utilises the E3 V6.

Bondtech Drive Gears: The hot-end is nothing without the steady flow of filament, and the extruder provides a steady filament feed with the upgraded Bondtech drive gears. These grip the filament from either side to help reduce slip and increase the pushing force. This type of gearing is especially useful for flexible filaments which are notoriously difficult to print with.

Automatic filament loading: Traditionally filament loading could be troublesome, but here pop the filament into the extruder, and a sensor detects it and sucks it into the machine. Once in you then just need to select the filament type.

Steel Spring Head bed: Removing prints from the print platform can be a real issue, the original i3 featured a glass plate and bull clips holding it in place. That improved with the MK2 and now there's a magnetic HeatBed with an alloy PEI coated spring steel sheet.

A big new feature of the MK3S is the removable magnetic print platform, this makes it easier to remove prints (Image credit: TechRadar)

This is quick and easy to remove, and a quick flex of the sheet enables the print to be removed with ease. The MK3S ships with a smooth PEI sheet but there's also a textured powder coated version available for greater adhesion for materials such as nylon.

Extruded aluminium frame: Rigidity of the original i3 depended on the quality of the build with construction based around long threaded bolts. The design and build have taken an enormous leap forward with aluminium extrusion introduced in the MK3 and is used for the Y-axis and high-quality lead screws.

As with the original Prusa, the Original Prusa i3 MK3S features multiple printed parts alongside high-quality stepper motors, lead screws and bearings (Image credit: TechRadar)

Quiet motors: 3D printers like 2D printers had a reputation for noise due to the multiple stepper motors working away.

The standard was Nema 17, which were relatively cheap, Prusa now uses the highest quality and coupled them with Trinamic2130 drivers with cooling coming from Noctua fans. Adding a stealth mode, now makes this printer far quieter than the majority of other printers on the market.

Power loss recovery: Anyone who 3D prints will know how long some prints can take; hours and sometimes days. There is nothing worse than losing power during that process. Usually from some helpful sole accidentally switching it off or tripping over a cable.

The MK3S has full loss recovery, so if you do lose all power, then don't worry, the printer will restart from where it left off.

Avoid skipped layers: Not a common issue at first, but as your printer gets older, skipped layers can be a problem. As well as helping to dampen down the sound of the motors the Trinamic2130 drivers along with the EINSY RAMBo motherboard can detect if a skip or layer shifted.

Finally on the significant features is the P.I.N.D.A. 2 probe. There are two thermistors on the machine, one to check the ambient temperature of the electronics and the new P.I.N.D.A. 2 probe which helps to adjust for temperature drift at the print level and ensures that the first later is always correct.

This pretty much covers the major new features, and these join the more standard specifications.

Build volume: 25 x 21 x 21cm
Memory: Integrated LCD and SD card reader (8GB SD Card included)
Nozzle size: 0.4mm nozzle (Can be changed)
Layer height: 0.05mm (50 Micron)
Bed: Automatic levelling bed
Print Surface: Heated bed with cold corner compensation
Skew: Automatic Skew axes compensation
Software: PEO print platform
Materials: Extensive material support
Included materials: 1kg filament included
Power: PLA 80W / ABS 120W

Setup and materials

Weighing in at 7kg and measuring 50×40x55 cm (L x W x H) without the spool holder attached, the printer is by no means small. Lift it out of the box, however, and the open design and neatly packed and bound wires and the printer doesn't feel overbearing.

The footprint of 50cm x 40 cm is relatively large, but with your average kitchen worksurface or desk having a depth of around 60cm, the size is just right for sitting on your desktop.

Once in place, the spool holder can be clipped onto the mainframe, all zip ties and packaging remove and the power cord inserted.

Installing the filament is exceptionally easy. With the power and Auto Feed on, dip the end of the filament into the hole in the extruder and it's sucked in, then select the filament type, and a few minutes later molten filament appears through the nozzle.

FFF printers are by far the most popular form of 3D printers and as such the MK3S has a huge selection of materials that can be used (Image credit: TechRadar)

When it comes to changing the filament select eject using the small LCD with the control board, and the filament pops out, and another filament can be installed.

It's then just a case of running through a few flight checks, the handy paper manual that comes in the box outlines these in detail, and then you're ready for your first print.

Before loading my own models, I tested the printer using the 3DBenchy test model, along with a couple of others that came with pre-installed on the SD Card.

One of the best known 3D print tests. The Original Prusa i3 MK3S manages to produce clean prints at all quality settings with a little fine stringing at the highest quality (Image credit: TechRadar)

After a couple of hours and the prints had finished and no issues, miss prints or errors. The quality of the prints was also exceptional.

Having confirmed that the printer had arrived in one piece, was all working and nothing was out of place mechanically I checked for firmware updates. This test was conducted using firmware version 3.7.1.

I also loaded three different slicers with the i3 MK3S profiles: Simplify3D, Cura 4.0 and PrusaSlicer.

Setting up the Original Prusa i3 MK3S was easy enough on Simplify3D and Cura, and of course, PrusaSlicer which has been purpose-built for the machine.

PrusaSlicer is relatively straight forward with the application running through the printer selection and options at the outset. It's then just a case of loading your STL file ready for printing and selecting the quality options you want.

For an in-house piece of software, it's impressive with plenty of options, both for the settings and preview.

Navigation through the application is straight forward, and one feature that I like is the ability to flash the firmware directly from the application once connected through USB.

It also has a few convenient options, such as the Place on Face, which is a huge help when rotating the model into position, and Cut, which enables you to cut models in half. The parts can then be exported as plates, there is a little toing and froing, but it's handy.

In use, PrusaSlicer was solid, no glitches through the test and with support for STL, OBJ, AMF and 3MF it has excellent overall compatibility.

Few 3D printers feature their own slicer software but here Prusa has created PrusaSlicer which proves to be a formidable partner to the machine (Image credit: TechRadar)

There is an STL fix option which is an excellent addition, for simple fixes it seemed to work well, but for larger more complex models it had few more issues.

Once you've adjusted the settings in PrusaSlicer, you can then export the G-Code out to SD card or print directly.

If you opt for the card route, then the SD card can be slotted into the side of the control panel on the front of the printer, and then the LCD user interface and control buttons enable you to select the print you want.

This control panel doesn't just activate filament load and unload, you can swap filament and enter ultra quite stealth mode during printing (Image credit: TechRadar) (Image credit: Image credit: TechRadar)

This interface and control board can also be used to abort prints if things go wrong, calibrate when needed, and there are plenty of other options and adjustments that you can delve into.

One notable feature that I started to use despite the slight slowdown in print speeds was the stealth mode. This can be switched on during a print, so if you have to work and the noise of the printer is becoming too much then you can quickly switch on Stealth mode as required.

Two features that stand out are the resume print after a power cut and the ability to swap filament during printing; here demonstrated to the extreme (Image credit: TechRadar)

Another feature that has it's used and helped to save on filament is the easy ability to swap filaments during printing. Again just select the option from the menu to unload the old, install the new and the print continues with the new colour, it's all very smooth in use.

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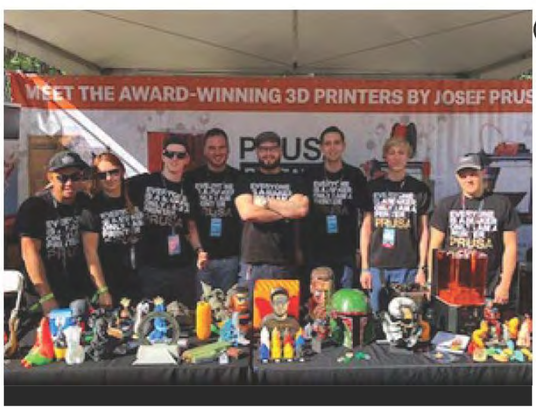
Meet Josef Prusa and our team at events around the world!

The community has always been important to us. We try to visit as many community events as possible, so we can **talk to our customers in person**. We want to hear about the awesome projects that came to life with the help of our printers. Your feedback is crucial. That's why we attend not only huge trade shows and business events, but **small Maker Faires and festivals** around the world as well. You can always spend a few minutes with a casual chat with our team members or even with **Josef Prusa** himself. If you have a tip for an interesting event in your neighborhood, let us know (https://www.prusa3d.com/#contact).



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makerfairevienna.com (https://makerfairevienna.com/index-en)

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- ## 3D PRINT 2020, LYON, FRANCE

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  http://www.3dprint-exhibition.com (https://www.3dprint-exhibition.com/)

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- ## EAST COAST REPRAP FEST, BEL AIR, USA

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  eastcoastreprapfestival.com (http://eastcoastreprapfestival.com/)

  Join our Facebook Event page (https://www.facebook.com/events/313227182667208/)!

- ## MODEL HOBBY, PRAGUE, CZECH REPUBLIC

  October 17-20, 2019

  modelhobby.cz (https://www.modelhobby.cz/en/)

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  brno.makerfaire.com (https://brno.makerfaire.com/)

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- ## MAKER FAIRE, ROME, ITALY

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  Join our Facebook Event page (https://www.facebook.com/events/2352571728321269/)!

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- ## MAKER FAIRE, HANNOVER, GERMANY

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  Join our Facebook Event page (https://www.facebook.com/events/482873259247337/)!

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  Join our Facebook Event page (https://www.facebook.com/events/353233698911569/)!

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  March 23-24, 2019

  maker-faire-sachsen.de (https://www.maker-faire-sachsen.de/)

  Join our Facebook Event page (https://www.facebook.com/events/2262641687151798/)!

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  midwestreprapfest.org (http://midwestreprapfest.org/)

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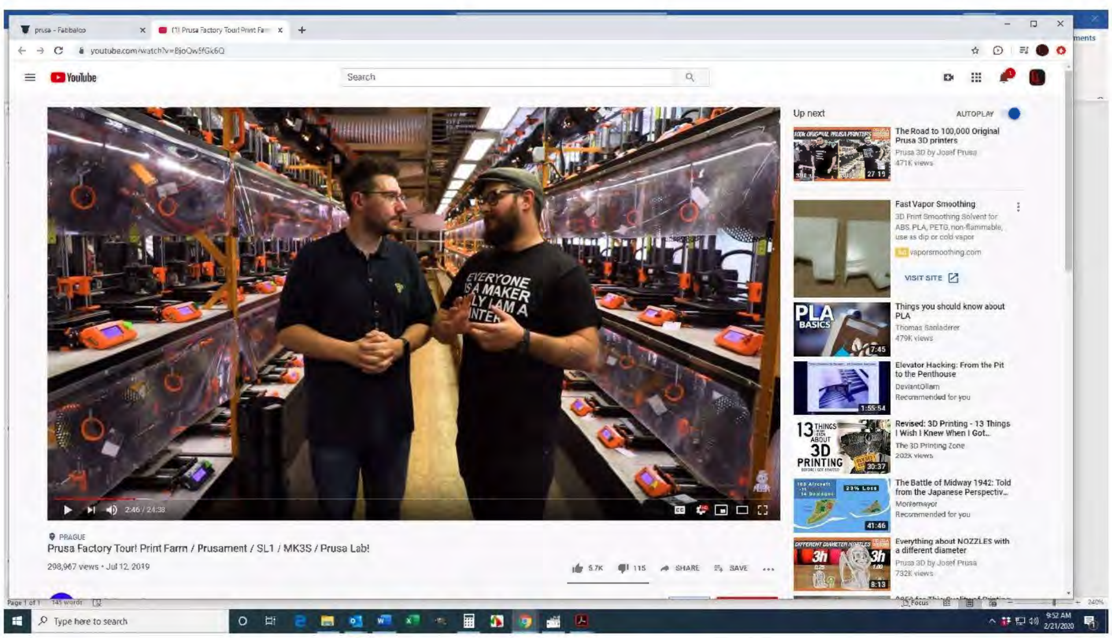

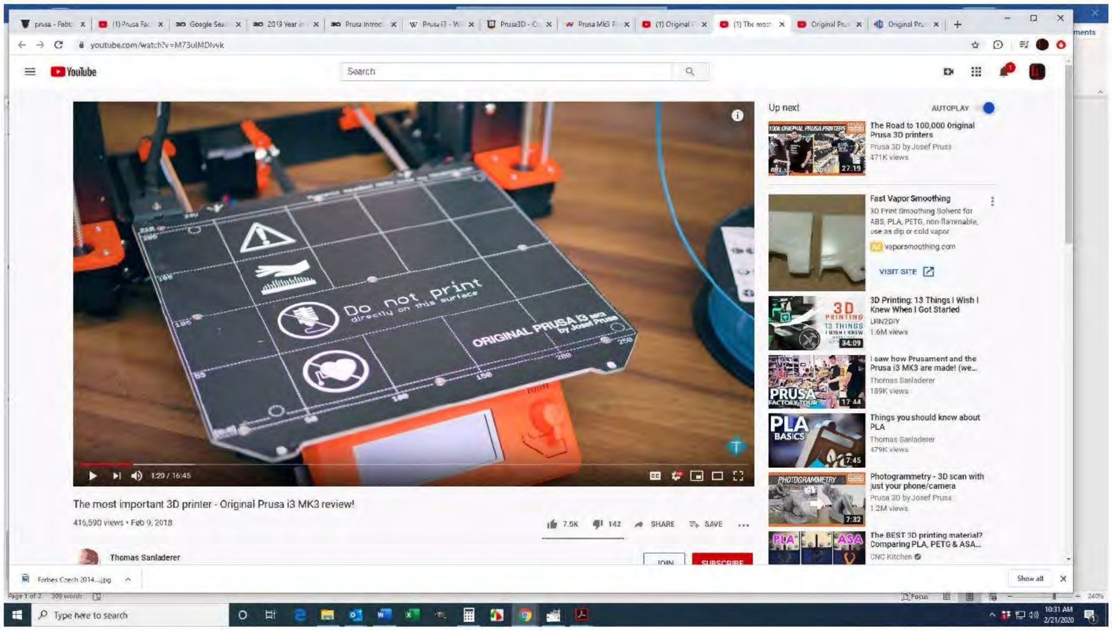
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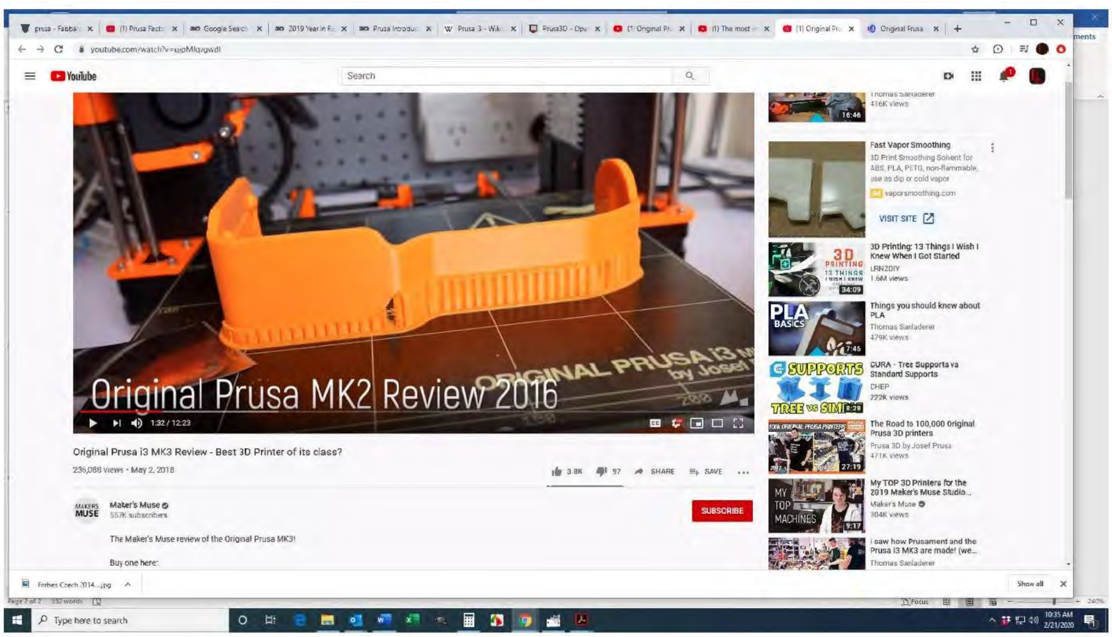
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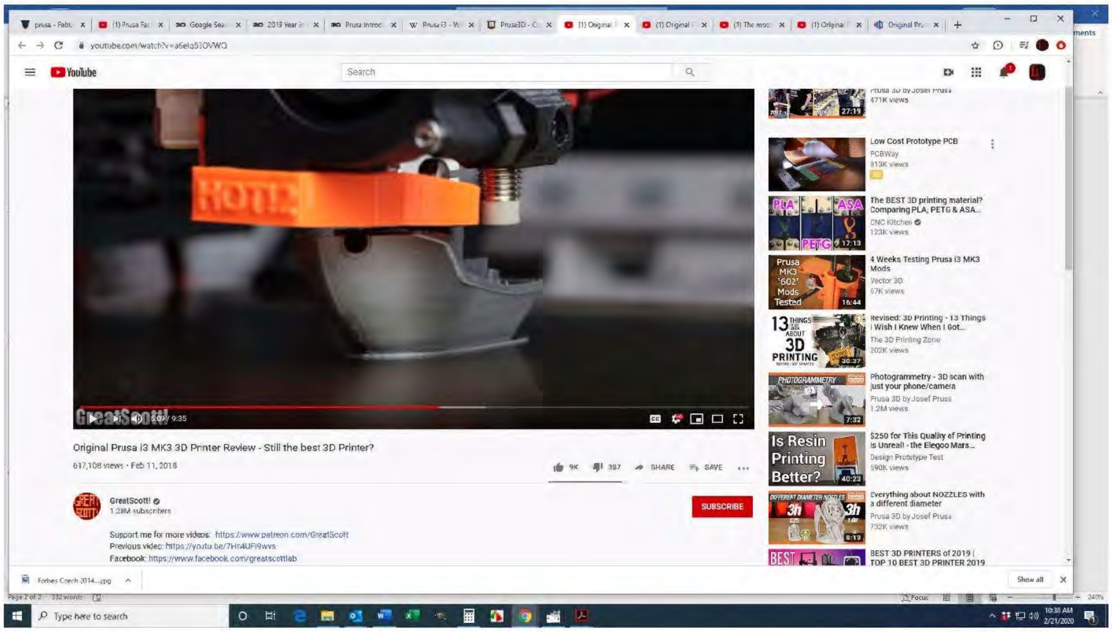
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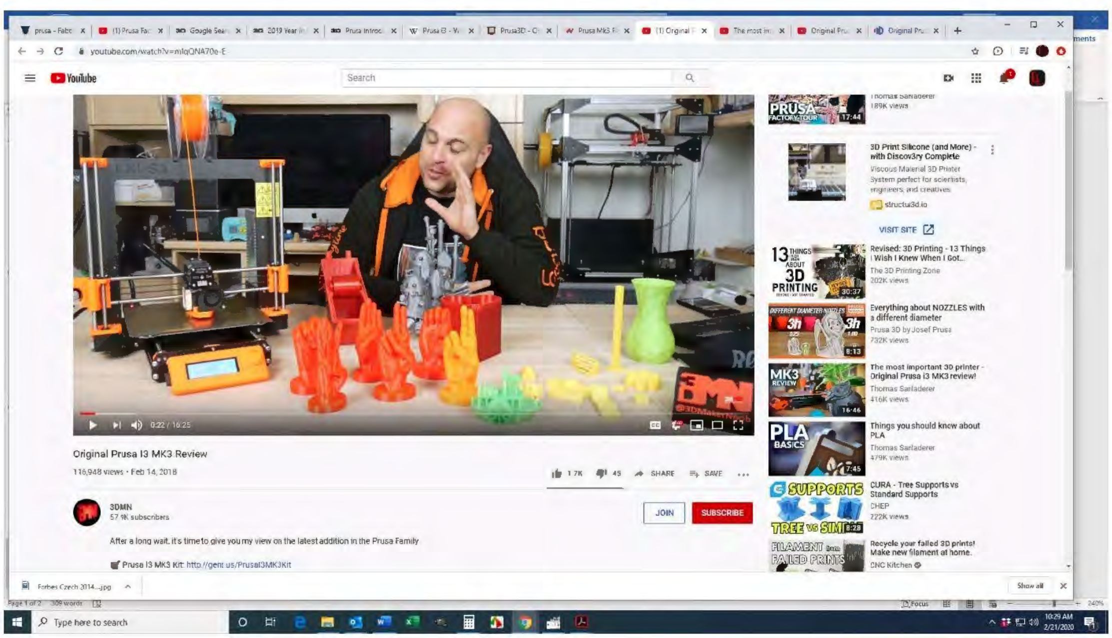
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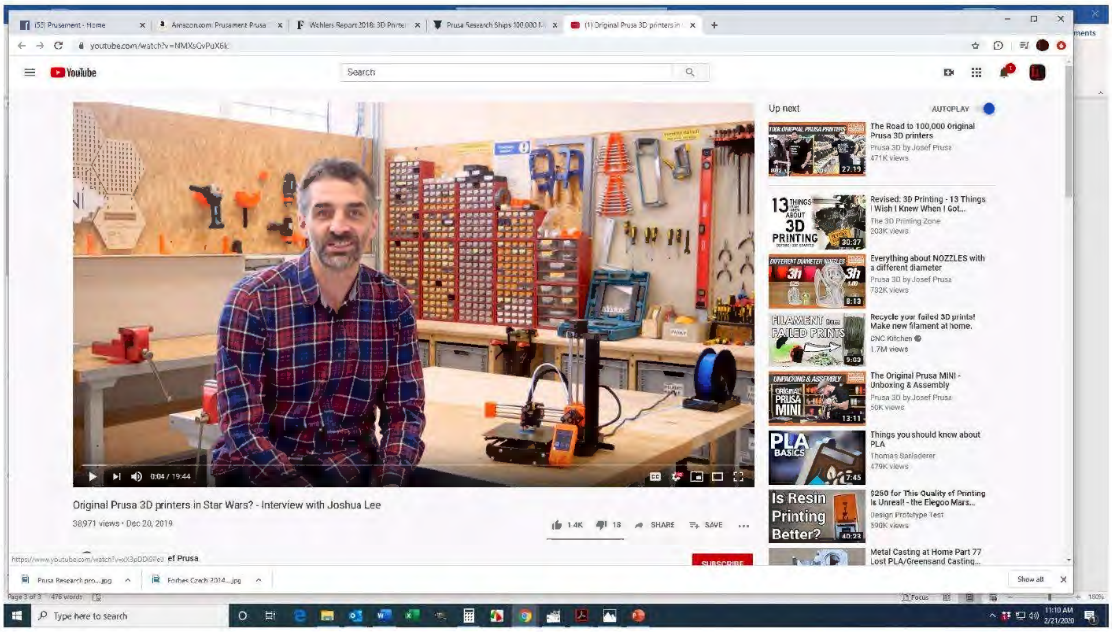
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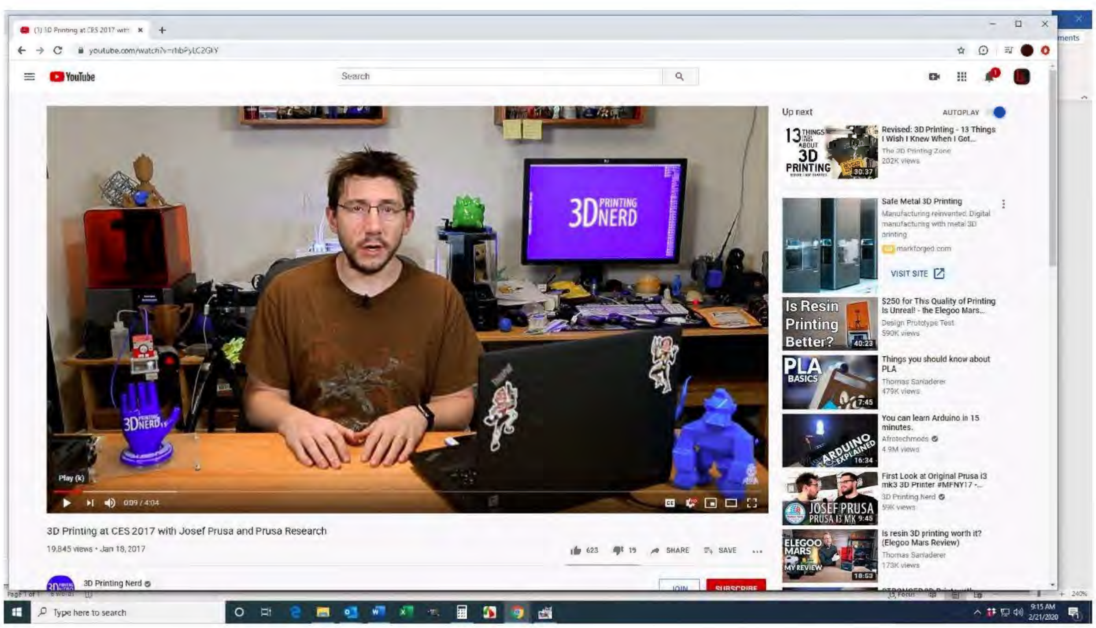
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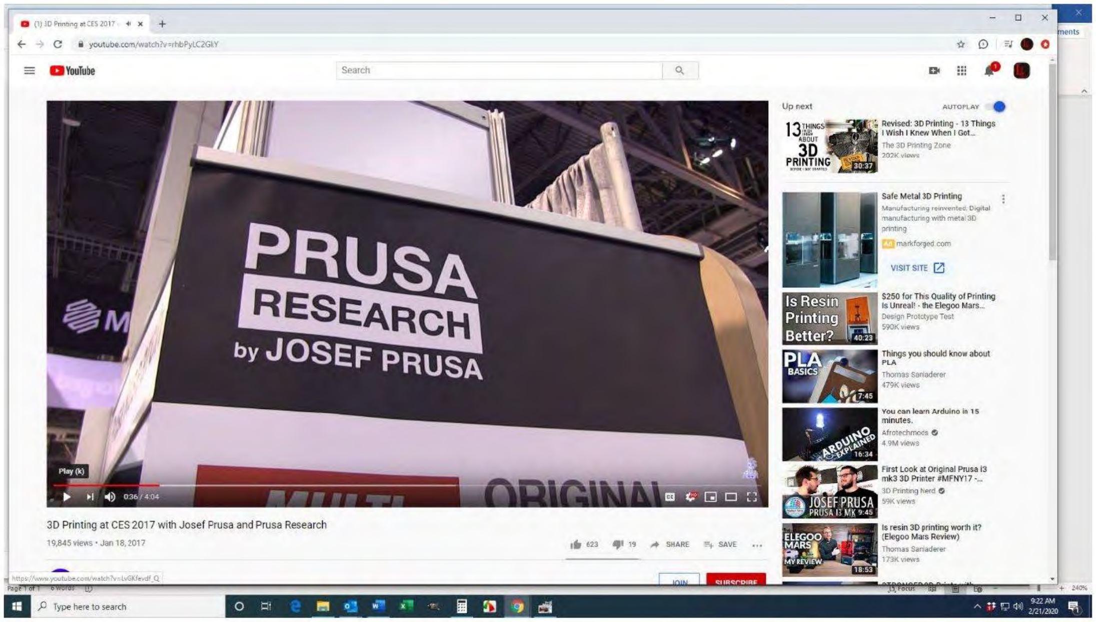
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3D Printing

Original Prusa i3 MK3 Review

by Joseph Flynt • Posted on May 19, 2018 12 Shares

Released in late 2017, the Original Prusa i3 MK3 is the newest version in the Prusa i3 family, designed by Josef Prusa and distributed by his own company, Prusa Research. It is the direct successor to the MK2 and the MK2S, rolling out with a dizzying number of upgrades and innovations other 3D printers under $1,000 can't hope to match right now.

The MK3 is unlike any other product currently out on the market. It's an almost flawless 3D printer, boasting a package of smart features that serve to make 3D printing as easy and as accessible as possible to everyone, from complete beginners to hobbyists and professionals.

Shipped from the Czech Republic, the MK3 is available in two packages, similar to the MK2: a DIY kit package and a pre-assembled package. For the DIY kit, the listed price on the Prusa Research official site is $749, while the pre-assembled package goes for $999. Keep in mind the tax and the shipping fee are not included in both listed prices.

It's recommended that you go for the cheaper DIY kit. Because assembling a 3D printer from scratch will not only teach you about the inner mechanics of 3D printers but also make you more prepared for troubleshooting the inevitable issues down the road. And quite frankly, the $200+ price difference is a significant amount for most folks.

Unlike most other 3D printers, the MK3 is not readily available at popular online stores. Prusa Research ships the MK3 in batches, so the waiting game is longer than usual. Lots of customers have had to wait for weeks for their unit to arrive, especially the early birds in 2017. But don't worry, the MK3 is definitely worth the wait.

It's easy to get technical help for the MK3. Prusa Research employs a customer service team ready to answer inquiries anytime and in different languages. In addition, there are unofficial groups online that you can turn to in case you need help, most especially during the assembly of the MK3 DIY kit.

The Design

The open-framed MK3 looks identical to the MK2 and MK2S, at least on the surface level. It's got the familiar orange-and-black color scheme and the LCD interface mounted at the base. But the similarities end there. The MK3 boasts upgrades in every other area.

A Cartesian style 3D printer, the MK3 is more robust than the MK2S, featuring a reworked Y-axis and a more stable aluminum frame overall. The print head is equipped with dual fans and a Bondtech extruder, which comes with a pair of gears for more force during the filament feed. This setup makes the MK3 more reliable, especially with flexible filaments. The print head also comes with an E3D V6 nozzle that can easily handle different types of materials with little to no issues.

The MK3 has a magnetic heated bed equipped with a replaceable spring steel sheet with a PEI surface, giving the print bed excellent adhesion out of the box and making the print removal extremely easy. The magnetic bed is not as flimsy as other magnetic print beds seen on other 3D printers – the magnets are really strong and have no trouble keeping the print bed in place. By default, Prusa Research includes the smooth PEI sheet in the package, but you can also opt for the textured, powder-coated PEI for the textured, powder-coated PEI.

Most importantly, the motherboard the MK3 comes with is brand-new. The EINSY RAMBo motherboard with Trinamic drivers is the chief reason the MK3 runs a smooth and impossibly quiet operation. In addition, it can accurately detect and fix shifted layers, which translates to more consistency and better prints every time.

Like with the MK2 and MK2S, the spool holder of the MK3 is attached at the top. For other 3D printers with a similar setup, a top-mounted spool holder can affect the stability. This isn't the case with the MK3, however. On the flip side, the spool holder can be tricky to attach. But the good news is that you can easily print a new one in case you break it during the assembly.

The Setup

The MK3 arrives in an impeccably organized and tightly secured package. Prusa Research has good quality control, which is even more impressive once you consider the sheer number of units the company ships per batch. In case you haven't heard, the Prusa i3 printers are the most popular 3D printers in the world.

DIY kits are known for being a pain in the butt, especially for beginners. For most DIY kits, the daunting assembly process can take over 10 hours, and that doesn't even include the initial calibration. But the MK3 DIY kit isn't like that. It's the easiest DIY kit to assemble, not counting semi-assembled DIY 3D printers like the Creality CR-10S.

The MK3 can be fully assembled in just six hours – Prusa Research says the current record is four hours, which is almost comical considering all the parts involved. And the biggest reason for that unbelievably fast assembly time is the comprehensive instruction manual for the MK3. It's obvious that Prusa Research spent a lot of time on the manual to make sure everyone gets everything right the first time around. It's detailed, easy to follow, and includes high-quality images.

Everything you need to get started right away is included in the package, and that includes a spool of PLA filament, pre-loaded tests models on the included SD card, and even a handbook that covers the basics of 3D printing. The latter is especially notable since lots of manufacturers don't even bother with documentation, let alone a well-written handbook.

Once fully assembled, the MK3 lets you start your fun in less than one hour. Loading the filament is extremely easy and leveling the print bed is a trivial matter, courtesy of the automatic bed leveling technology. The automatic bed leveling technology ensures that the print head is always at an optimal distance from the print bed. In addition to all of that, the MK3 is already loaded with good print settings, so the first few prints won't look like absolute crap, which is often the case for most DIY 3D printers.

The MK3 is compatible with most printing software, including Cura and Simplify3D. But in case you prefer a printing software that specifically caters to the Prusa i3, you can use either PrusaControl or Slic3r Prusa Edition. The former is meant for casuals and beginners while the latter includes more advanced options for intermediate users.

The Features

There's a lot to unpack here. Seriously, the MK3 is so packed with features that it's ridiculous it doesn't retail for over $2,000. First of all, the MK3 is a completely open source 3D printer – the Prusa i3 design was Josef Prusa's contribution to the RepRap project. This means the MK3 source files are easily accessible on the internet for everyone, from individuals to companies, to use.

The MK3 is a smart 3D printer. It's equipped with a number of sensors designed to keep the entire operation safe, convenient, and idiot-proof. Leading the way is the filament sensor, which keeps track of the presence and movement of the filament. The moment the MK3 detects it is about to run out of filament, it pauses the print to allow you to load a fresh spool of filament.

Furthermore, the MK3 can detect a clogged nozzle, in which case the procedure is the same: the MK3 pauses the print and offers you the chance to clean the nozzle before resuming the print. Though a lot more reliable than the filament sensors on other 3D printers, the MK3 filament sensor isn't 100 percent on point. It's easily fooled by clear filaments, so it's best to turn it off before you print with transparent materials.

The MK3 comes with a power panic feature. In case of a power loss, the MK3 shuts down all the heating components and – get this – moves the print head to the side in order to keep the already printed object from getting messed up. And as soon as the power comes back, the MK3 can resume from where it left off as if nothing happened.

On a related note, the MK3 can also detect if the print head is being compromised. If you hold the print head during prints and prevent it from moving, the MK3 will immediately stop the operation to avoid potential damage. Finally, the MK3 comes with a pair of thermistors. The first thermistor measures the ambient temperature while the second is set in the PINDA 2 probe to account for temperature drift.

For connectivity, the MK3 can connect through USB and SD card by default, with an option for wireless connectivity. The default connectivity options should be enough for you unless you really want to send prints over the network.

The Performance

The MK3 is easy to prepare for prints. As noted above, loading the filament is extremely easy and will not require you to make significant adjustments. In addition, the print bed heats up really fast, embarrassing the slow-heating print bed of the Creality CR-10S, arguably the second-best 3D printer under $1,000.

The MK3 print quality is beyond impressive. If you've seen 3D models produced by the MK2 or

MK2S, then you know what to expect. It's smooth, accurate, and ridiculously detailed. It's definitely right up there with the print quality of the Ultimaker 3, the LulzBot TAZ 6, and the Creality CR-10S – three of the most highly regarded 3D printers on the market.

For example, the MK3 can create the popular Eiffel Tower 3D model, which involves intricate details, with incredible ease. It's the same thing for everyone's favorite test model, the 3DBenchy. The best part is that the MK3 is already capable of producing good results out of the box and will only require a fair amount of tinkering for more complex 3D models.

The MK3 is significantly faster than the MK2S, allowing you to print more objects per week. In addition to that, the MK3 is extremely quiet. It's so quiet that you can barely hear it even at close range, even in the normal mode. The low noise level is really impressive, especially considering the MK3 is an open-framed 3D printer.

The MK3 has an open filament system and has no trouble printing with filaments from third-party manufacturers. It can already print with several types of materials out of the box with minimal tinkering on your part – most 3D printers are limited to PLA at the onset. The Bondtech extruder, the E3D V6 nozzle, and the heated build plate allow the MK3 to print with even the most complex materials. Combine that with the large build size of the MK3 and you get a lot of room for experimentation.

Prusa Research offers a multi-material upgrade for the MK3, which allows you to print with multiple filaments using just a single extruder system. It's a good add-on if you want to be fancy and want colorful prints, but not something we recommend right off the bat.

The Verdict

Tech Specs

- **Resolution:** 50 microns
- **Volume:** 9.8 x 8.3 x 8.3 in
- **Filament:** 1.75 mm
- **Types:** ABS, PLA, Flexible, HIPS, Nylon, and others
- **Weight:** 14 lb
- **Connect:** USB, SD card

The Pros

- Open source
- Easy to use
- Fantastic print quality
- Extremely quiet
- Removable magnetic heated print bed
- Good adhesion on the print surface
- Filament run-out sensor
- Power panic
- Crash detection
- Automatic bed leveling

The Cons

- Filament sensor has issues with clear filaments
- No enclosure

This is a highly recommended 3D printer. The MK3 is one of the best 3D printers you can get today. It is without a doubt the best 3D printer under $1,000, edging out the Creality CR-10S by a significant margin. It offers outstanding quality for a reasonable price and comes with a truckload of features. There are only two legit reasons you should go for another product in the same price range: a) you are on a strict budget and would rather get a significantly cheaper product, and b) you want a larger build volume.

Original Prusa i3 MK3: 4.9/5

4.2/5 75 ratings

Joseph Flynt

I love diving into the latest and greatest in emerging technologies and seeing what they can do. I enjoy running when I'm not thinking about tech.

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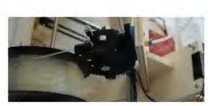
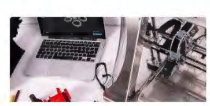

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THE 10 BEST 3D PRINTERS IN 2020

Last update: February 6, 2020
By Martin Lansard

Contents

WHAT IS THE BEST 3D PRINTER IN 2020?

We reference over 1,500 3D printers in our 3D printer database. Finding **the best 3D printer** can be a challenging and time-consuming task, especially for those who are new to 3D printing. That's why we decided to put together this list of the best desktop 3D printers in 2019.

Our goal is to cut through the clutter and select ten of the best 3D printers currently on the market within different price ranges (from $239 to $3,495). For this list, **we focused on top-rated consumer 3D printers**, also referred to as desktop 3D printers. We didn't consider the most expensive 3D printers on the market, as prices can reach up to hundreds of thousands of dollars and are exclusively industrial 3D printers.

This best 3D printer selection is based on following criteria:

- **Metascore of 4.0/5 and over**
- **Under $3,500 and available**
- **Extrusion technology 3D printers**

THE 10 BEST 3D PRINTERS ON THE MARKET IN 2020

3D printer	Rating	Build volume	Release year	Country	Price (MSRP*)	Buy
Original Prusa i3 MK3	4.7/5	250 x 210 x 200 mm	2017	Czech Rep.	$999	
Sindoh 3DWOX 1	4.6/5	210 x 200 x 195 mm	2018	South Korea	$1,499	BUY
CraftUnique CraftBot PLUS	4.5/5	250 x 200 x 200 mm	2015	Hungary	$1,099	BUY
Tiertime UP mini 2 ES	4.5/5	120 x 120 x 120 mm	2018	China	$699	BUY
Creality Ender 3	4.3/5	220 x 220 x 250 mm	2018	China	$229	BUY
FlashForge Creator Pro	4.2/5	227 x 148 x 150 mm	2016	China	$899	BUY
Creality CR-10	4.2/5	300 x 300 x 400 mm	2017	China	$439	BUY
Dremel DigiLab 3D45	4.1/5	254 x 152 x 170 mm	2017	US	$1,799	BUY

The Original Prusa i3 MK3 grabs the top spot in our selection of the best 3D printers in 2019.

LulzBot Mini 2	4.1/5	152 x 152 x 158 mm	2017	US	$1,500	BUY
Ultimaker 3	4.0/5	197 x 215 x 200 mm	2017	Netherlands	$3,500	BUY

Showing 1 to 10 of 10 entries

This table shows our selection of the 10 best 3D printers on the market in 2020, ranked according to metascores. It is possible to rank by price or build volume by clicking on that specific column title.

*MSRP: manufacturer's suggested retail price. These can vary over time and/or from one country to another (shipping fees, import taxes, etc.).

This list is non-extensive, there are many other 3D printers on the market. Although these 3D printers are packed with quality features, we recommend doing your own, additional research.

*Methodology/disclaimer: we have not tested all of the desktop 3D printers in this list. Our selection is based on overall feedback from specialized, trusted sources as well as crowdsourced user reviews. Read more about **How we work**. To get a full overview of the 3D printer market, our **3D printer comparison engine** is a useful tool.*

We also have more price-specific selections:

- **The best 3D printers under $300**
- **The best 3D printers under $1,000**

OVERVIEW OF THE BEST 3D PRINTERS IN 2020

Prusa Research Original Prusa i3 MK3

- **Metascore**: 4.7/5
- **Build size**: 250 x 210 x 200 mm
- **Country**: Czech Republic
- **Price**: $999

The Original Prusa i3 MK3 is a workhorse 3D printer manufactured by Prusa Research. All of the Prusa MK3's parts are open source, making it easy to repair and maintain. The Original Prusa i3 design is well-known for its reliability, robustness, and upgradability. This 3D printer's previous versions (**MK2** and **MK2S**) have received numerous awards from 3D Hubs and Make: in various categories over the years.

The Original Prusa i3 is also widely praised by the 3D printing community as one of the best desktop 3D printers ever made.

Full specs: **Original Prusa i3 MK3**

Sindoh 3DWOX 1

- **Metascore**: 4.6/5
- **Build size**: 210 x 200 x 195 mm
- **Country**: South Korea
- **Price**: $1,499

BUY

The 3DWOX 1 is an upgraded version of the popular **3DWOX DP200** from the same manufacturer. With its HEPA filter and closed frame, the Sindoh 3DWOX 1 is convenient for office and home environments. This desktop 3D printer boasts a 5-inch touchscreen, and users can also launch and monitor prints from the 3DWOX mobile app.

Sindoh also manufactures the **3DWOX 2X**, a (more expensive) desktop 3D printer with IDEX (independent dual extruders).

Full specs: **Sindoh 3DWOX 1**

CraftUnique CraftBot PLUS

- **Metascore**: 4.5/5
- **Build size**: 250 x 200 x 200 mm
- **Country**: Hungary
- **Price**: $1,099

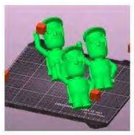
BUY

The CraftBot PLUS (2nd generation) won the 3D Hubs "Best plug-n-play 3D printer" award two years in a row, in 2017 and 2018. This FFF 3D printer's all-steel frame provides durability and stability while its touchscreen and Wi-Fi connectivity make it easy to use.

One of CraftUnique's key selling points is their customer service which is, according to users, very helpful and responsive.

Full specs: **CraftUnique Craftbot PLUS**

prusa



Prusa Rebrands And Improves Software Systems

worldwide will also be upgrading to PrusaSlicer soon. Via Prusa Research … main software tool was Slic3r Prusa Edition, sometimes referred to as "Slic3r PE". This was a fork … prusa … of the open source Slic3r project that Prusa Research has been incrementally developing for some … Prusa Rebrands and Improves Software Systems … prusaslicer.jpg … PrusaSlicer to replace their previous management software. Previous to the announcement, Prusa Research's … The plating view from the new PrusaSlicer [Source: Prusa Research] Prusa Research introduced … Prusa Research introduced PrusaSlicer to replace their previous management software. …

ASA 3D Printer Filament For The Masses

off handsomely for Prusa Research, who quickly realized they could not keep up with demand. After … prusa … . Czechia-based Prusa Research has been producing their own 3D printer filament — Prusament — for a year … not provide any quality data on individual spools. Prusament Success This attention to detail paid … Have you ever used ASA 3D printer filament? A new offering from Prusa Research may provide a … Orange ASA 3D printer material from Prusament line [Source: Prusa Research] Prusa Research has … producers of filament for 3D printers. However, there's a difference with Prusa Research's approach … prusament-asa-prusa-orange-850g.jpg …

Prusa Takes Aim At Thingiverse

prusaprinter-import.jpg … not interested in those programs. PrusaPrinters Meanwhile, Prusa Research launched PrusaPrinters.org … prusa … Thingiverse 3D model entries directly into their own repository, PrusaPrinters.org. Thingiverse History … prusaprinters … is certified for use by any registered user of PrusaPrinters.org. Prusa Research *explains: "To … Prusa Takes Aim At Thingiverse … Prusa Research seems to be taking aim at capturing the crown of 3D model repositories from Thingiverse with the help of a one-touch import tool. … recent newsletters, Prusa Research revealed they have developed a tool to automatically import … Importing 3D models directly from Thingiverse [Source: PrusaPrinters] Prusa Research seems to be …*

Prusa News

Latest PRUSA news Prusa Research is one of the most interesting companies in the 3D print space … Prague-based Josef Prusa, who at the time had designed an open source concept for a new 3D printer to … popular, and subsequently Prusa decided to found a company to market kits from which one could build … original Prusa hardware and the 3D models on their community site, PrusaPrinters. Looking for more … out to be quite popular. As a result, Prusa Research began shipping large numbers of desktop 3D … Prusa News …

The Incredible New Services From *Prusa*

prusaprinters-europe_result.jpg … prusa … an incredibly new and valuable functions to the Prusa community, and given their already large user base it is bound to be successful. Via PrusaPrinters … change. Josef Prusa explains: "It's now over four years since the launch of PrusaPrinters.org. I … discussion forum. Prusa's new Model Marketplace [Source: PrusaPrinters] The Model Marketplace is a … The Incredible New Services From Prusa … Locations of Prusa printers in Europe [Source: PrusaPrinters] A new and potentially game-changing … A new and potentially game-changing 3D model repository has appeared: PrusaPrinters. … Prusa printer operators willing to provide tech support [Source: PrusaPrinters] One of the success …

Prusa Introduces Filament Line With Powerful Process

a maximum variance of +-0.05mm. While this sounds decently small, Josef Prusa points out that this … A spool of high-quality 3D printer filament [Source: Prusa Research] Prusa Research has done … prusa … on the market. Prusa calculates that the standard quality standard of +-0.05mm actually results in … Prusa Research has done something few, if any, 3D printer manufacturers have done: develop their own in-house produced filament. … prusament-ov_result.jpg … measurements as Prusa suggests, but certainly not all do. And this results in a great deal of bad filament … Prusa Introduces Filament Line with Powerful Process … as well. Current listing of two Prusament filament for sale [Source: Prusa Research] Here's the best …

Secrets Of *Prusa* Research 3D Printer Manufacturing

$Prusa Factory Tour … prusa-plant-tour.jpg … prusa … best we've seen to pick up the

best details. Telling, led by Prusa Research founder Josef Prusa … Prusa Research produces their premium 3D printer filament, Prusament. What you will notice is the … Secrets of Prusa Research 3D Printer Manufacturing … purchase very high-quality filament like Prusament for very reasonable pricing. Prusa Printer Quality … Prusament real-time quality monitoring log [Source: YouTube] The video tour continues as Josef Prusa … prusament … A video tour inside the operations of Prusa Research gives a close look at what it takes to make high-quality 3D printers and 3D printing filament. … Joel Telling and Josef Prusa [Source: YouTube] A new video explores the secrets of Prusa Research's …

Implications Of *Prusa's* New 3D Model Repository

prusa … day, Prusa announced a series of new online services, including a rather comprehensive platform for … I'm thinking a lot about Prusa's new 3D model repository, and wondering what it might mean. … prusaprinters-models-ov_result.jpg … Some new 3D models uploaded to Prusa's Model Marketplace [Source: PrusaPrinters] I'm thinking a lot … bothering me. No, don't get me wrong: the new Model Marketplace from Prusa seems to be a well-designed … new player in the game: Prusa. At first glance, Prusa's repository is incredibly small compared to … Implications of Prusa's New 3D Model Repository … about Prusa's new 3D model repository, and wondering what it might mean. As we reported the other …

Surprise! *Prusa* Announces MINI 3D Printer

-based 3D printer, the SL1. The Original Prusa MINI 3D Printer Now they've announced a new machine, the … Prusa Research announced a brand new desktop 3D printer, the Original Prusa MINI. Its surprisingly … prusa … announced a brand new 3D printer, the Original Prusa MINI. The Prague-based company has been extremely … The new Original Prusa MINI 3D printer [Source: Prusa Research] Prusa Research has unexpectedly … Original Prusa MINI. As you might expect, this machine is somewhat smaller than the standard-sized … Surprise! Prusa Announces MINI 3D Printer … prusa-mini.jpg … older sibling — and some surprises, too. First, the basics. Original Prusa MINI Specifications …

Prusa Explains MK3 Updates

Prusa Explains MK3 Updates … prusa … magnetic steel print surface. But Prusa is a company constantly in motion. They do not simply make a … Josef Prusa taking care of his 3D printing business In a rather long blog post, Josef Prusa … printer. Prusa Printers based that unit on their experience with the previously successful MK2 and … is something almost no other 3D printer manufacturer will do. Prusa is an open source company and … design an ship it; they listen, learn and make adjustments on each batch shipped. Prusa explained some … In a rather long blog post, Josef Prusa explained some of the backstory regarding ongoing changes …

Things Looking Good For *Prusa* Research

surviving companies. One that's far beyond mere "surviving" is Prusa Research. The Czech-based company … Things Looking Good For Prusa Research … prusa … Visiting with Josef Prusa After the "consumer crash" of desktop 3D printing there remains the … their own desktop 3D printer using the Prusa design, but several companies manufacture and market 3D … After the "consumer crash" of desktop 3D printing there remains the surviving companies. One that's far beyond mere "surviving" is Prusa Research. … was founded by Josef Prusa, who is notable for designing the open source Prusa 3D printer that has … printers using the very same design. One of those companies just happens to be Prusa Research itself …

3D Printer Filament Specifications: Who Can You Believe?

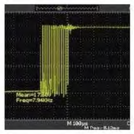
Josef Prusa himself. Now his company helps everyone have inexpensive access to this well-thought-out … that if you purchase a Prusa, you're really getting on a long term upgrade train that keeps your … prusa … and assembled versions of the famous Prusa i3 desktop 3D printer open source design, created by … Is 3D printer filament really meeting specifications? I'm reading an interesting story from Prusa … Printers that reveals a rather shocking fact about 3D printer filament. Prusa Printers markets kits … I'm reading an interesting story from Prusa Printers that reveals a rather shocking fact about 3D printer filament. …

Prusa's Manufacturing Capacity Is Incredible

prusa-marney - 1_result.jpg … prusa … 2,000 units in total. Prusa now made that many machines in only a couple of weeks. But now things … from Prusa's new resin machine [Source: Fabbaloo] At this point it appears that Prusa is now the low … we were told last year? Yes, indeed. We were told Prusa now produces about 450 units per day. Wait … we learned much about Prusa Printer's manufacturing capabilities. The Prague-based manufacturer of … Josef Prusa himself with Fabbaloo's Business Manager, Marney Stapley [Source: Fabbaloo] At formnext … Prusa's Manufacturing Capacity Is Incredible … At formnext we learned much about Prusa Printer's manufacturing capabilities. …

Prusa Sets World Record By Simultaneously Running 1096 3D Printers

Prusa Research's feat is on another level entirely. Prusa World Record Attempt Unlike any other … Prusa Research sets the world record for simultaneously operating 3D printers [Source: YouTube] We … prusa … prusa-world-record.jpg … Prusa Sets World Record By Simultaneously Running 1096 3D Printers … trivial and often untrue. But the story of this release of a video by Prusa Research has to be told, as … printers each, with an independent expert and referee to ensure validity Prusa World Record Procedure … party in the world, Prusa Research just happens to have 500 operating devices on hand: that's their … How many 3D printers can you run at the same time? Prusa's answer to that question is in the thousands, as they set a world record. …



Prusa No Longer Producing Loudspeakers

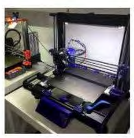
Waveform for the Prusa Research heat bed [Source: Prusa Research] I'm reading a fascinating post by … leading edge of the 30 Hz cycle. Thus Prusa Research is no longer selling loudspeakers, but you never … What should a 3D printer company do if they have a hardware problem? Tell us about it! That's what Prusa Research did for a crazy heat bed noise issue. … prusa … Prusa No Longer Producing Loudspeakers … prusa-noise-edge-solution.jpg … Prusa Research. Prusa Heat Bed Chirp Their noise was a regular clicking that seemed to be coming … Prusa Research explaining how they went about diagnosing a very elusive problem. The Czech … fascinating to me about this is the incredible transparency exhibited by Prusa Research in this regard. I …

Prusa Finally Releases MultiMaterial Upgrade

prusa-mmu-mounted_result.jpg … embarrassment at a less-than-perfect product, but here Prusa Printers has stepped up. Their admission that … from the public and especially their customers. Prusa explains some of the challenges involved in … Prusa Finally Releases MultiMaterial Upgrade … prusa … The new Prusa MMU 2.0 mounted on a 3D printer [Source: Prusa Printers] Prusa Printers finally … abandoned a few months ago. The reason for the sudden switch was a realization by Prusa Printers that the … device was prone to jamming due to the design of the feed tubes. CEO Josef Prusa explains: "We have … Prusa Printers finally released their long-awaited second version of their multmaterial upgrade. …

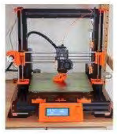
Wait, Is Consumer 3D Printing Back?

about Prusa Printers' astonishing production figures, I'm now wondering whether consumer 3D printing is … Prusa Printers' modest exhibition stand at formnext 2018 [Source: Fabbaloo] After thinking more … many others are now forgotten. But now we see that Prusa Printers, a company that literally … After thinking more about Prusa Printers' astonishing production figures, I'm now wondering whether consumer 3D printing is back. … prusa-booth - 1_result.jpg … prusa …



Could Cloned Equipment Be A Bother For *Prusa*?

prusa-bear-clone.jpg … potential competitors coming. Prusa Research is an open source company, and the publish the … Could Cloned Equipment Be A Bother For Prusa? … prusa … A Prusa i3 clone, with "Bear" upgrade [Source: Eric Au] Fabbaloo friend and maker Eric Au reports … specifications and part files for their devices, such as the Original Prusa i3 MK2. This allows others to "clone … , who operates a small farm of 3D printers, including a true Original Prusa i3, decided to try one of … Fabbaloo friend and maker Eric Au reports on his use of a Prusa clone 3D printer. … on his use of a Prusa clone 3D printer. Prusa Research is one of the leading providers of *desktop 3D …*



The *Prusa* Bear Upgrade

prusa-bear-upgrade.jpg … prusa … . Many of the Prusa community's upgrades are simple in nature, but there's one that is quite a bit … The Prusa Bear Upgrade … prusa bear upgrade … more serious. Switzerland-based Grégoire Saunier devised the Prusa Bear Upgrade, which is a … printer around: the Prusa Bear Upgrade. Prusa Research recently announced they have delivered over … the Prusa i3 models. These vibrations eventually transition to the moving nozzle, resulting in very … There's an exciting upgrade for the most popular 3D printer around: the Prusa Bear Upgrade. … The Prusa Bear Upgrade [Source: Thingiverse] There's an exciting upgrade for the most popular 3D …

Prusa Leaks New Firmware Features; Suggests Future Model Features

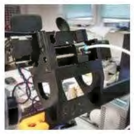
released "Original Prusa MINI" 3D printer. The MINI is a very curious device that I now think tells … prusa … . However, that's another story. Prusa Transparency Sometimes Prusa Research might say too much. They … Prusa Leaks New Firmware Features; Suggests Future Model Features … printer market. That might be true, but I think there's something else afoot here. Prusa Research … Prusa Research issued some news about their new Original Prusa MINI desktop 3D printer, and it leads to some interesting speculation. … prusa-connect-main.jpg … News on the Original Prusa MINI leads to some speculation [Source: Prusa Research] Prusa Research … a great deal about what is underway at the Czech company. Prusa MINI 3D Printer At first glance you …

The *Prusa* Air

the standard Mendel design. The otherwise unrelated Prusa design provided the inspiration for the … new Prusa Air through its radical efficiencies, hence its mention in the name of this new design. The … modifications to improve them in various ways. One such design is Mecano's Prusa Air, a modification of … pretty, all of which are accomplished. The Prusa Air version 2 has some unique features: Most … extruder used Improved placement of electronics and fasteners While the Prusa has become a very popular … The Prusa Air …

Prusa Enables Soluble Support

Original Prusa i3 MK2S desktop 3D printer, which many have been drawn towards due to its high reliability … prusa … professional machines. Prusa Research is well known for producing the ridiculously popular … physically possible on their multi-extruder machine, *the Original Prusa i3 MK2 MultiMaterial, a … Soluble support example made on a Prusa i3 MK2S Multimaterial 3D printer Prusa Research took an … you think, after their announcement that their new release of slicing software, Slic3r Prusa Edition … Prusa Research took an expected, but nevertheless interesting step forward this month by announcing a feature usually found on professional machines. … Prusa Enables Soluble Support …*



Good News: *Prusa* Abandons Original MK3 MultiMaterial Design

like the machine. But then Prusa upgraded their main machine to the MK3, with a large number of … prusa … announced a big change. Prusa Printers is one of the world's biggest suppliers of desktop 3D printers … be a lot more honest than companies that only tout good news. What bad news has Prusa told us? In … Good News: Prusa Abandons Original MK3 MultiMaterial Design … A peek at a prototype of Prusa's new Multi-Material extrusion system Josef Prusa provided an update … requirement to purge some material when colors are changed. Prusa has had some challenges with the … Josef Prusa provided an update on his company's progress on building, improving and shipping their …

Prusa Updates The *Prusa*: The I3 MK2 Lives

Prusa Updates The Prusa: The i3 MK2 Lives … prusa … The new Prusa i3 MK2 One of the most popular desktop 3D printers is the Prusa i3, but now it may … One of the most popular desktop 3D printers is the Prusa i3, but now it may become even more popular with its latest iteration. … includes a real E3d V6 hotend for reliability and speed. Prusa believes this could increase print speeds … not mentioned; for full details check out Prusa's post at the link below. Via Prusa … become even more popular with its latest iteration. The Prusa i3, produced in a fully open source … Prusa i3 model typically ends up on top of 3D Hubs' survey of popular 3D printers, besting many …

Hands On With The Original *Prusa* I3 Desktop 3D Printer

to review the single-extruder version of the Original Prusa i3; a recently announced upgrade … future. The Original Prusa i3 3D printer in the box Inside the box the Original Prusa i3 is packed … prusa … Hands on with the Original Prusa i3 Desktop 3D Printer … print failure. That's not the case on this machine. The Original Prusa i3 comes either assembled or … The Original Prusa i3 is a very fine 3D printer We got our hands on with a pair of assembled … We got our hands on with a pair of assembled Original Prusa i3's and ran them through some basic tests. … Original Prusa i3's and ran them through some basic tests. The Original Prusa i3 is one of the most …

Prusa Adds Sophisticated Calibration System

Prusa i3 MK2. We did write about the original MK2 back in May of this year when it was announced … may be assembled slightly differently from person to person. One of the bed sensors on the Prusa i3 … The Prusa crew have developed a rather sophisticated automated calibration system for their most recent desktop 3D printer, the Prusa i3 MK2. … prusa … MK2's auto calibration system The Prusa i3 MK2 now includes hardware and software to overcome … . This is the alignment error corrected by the Prusa i3 MK2's new auto calibration system First, the … The Prusa i3 MK2 now includes a powerful automated calibration system The Prusa crew have developed … Prusa Adds Sophisticated Calibration System …

Prusa Introduces "Smooth Variable Layer Height" To Combine Speed AND Quality

A rather smooth 3D print using Prusa Research's new SVLH slicing system Open source desktop 3D … prusa … printer manufacture Prusa Research introduced a fascinating new feature in their slicing software that … Prusa Introduces "Smooth Variable Layer Height" to Combine Speed AND Quality … occurs. The concept is an old one, but for some reason it hasn't been popularly implemented. Prusa … their flavour of the variable layer height algorithm during the last year. Josef Prusa believes … mediocre quality, hardly an optimal result. Now Prusa Research has provided a freshly modified … Open source desktop 3D printer manufacture Prusa Labs introduced a fascinating new feature in their …

Prusa Yields To Customer Demand: MK3 Upgrades Now Available

prusa … A detachable magnetic print surface, one of the key new features in the Prusa i3 MK3 desktop 3D … printer There was a bit of controversy earlier this month when Prusa Research announced the fabulous … Prusa Yields to Customer Demand: MK3 Upgrades Now Available … There was a bit of controversy earlier this month when Prusa Research announced the fabulous new Prusa i3 MK3 desktop 3D printer. … offering upgrades to the latest version in the past. Everyone who bought our Prusa i3 2.85mm could … new Prusa i3 MK3 desktop 3D printer. Not because of an issue with the MK3, but because there was no … clear upgrade path from a MK2 or earlier machine to the highly capable MK3. At the time, Josef Prusa …

Surprise: *Prusa* Releases MK3 Desktop 3D

Printer

prusa … important if you are running the MK3 at higher speeds, as above. Detail of the Prusa i3 MK3's new … Surprise: Prusa Releases MK3 Desktop 3D Printer … The all-new Original Prusa i3 MK3 desktop 3D printer, with many new features Unexpectedly, Prusa … true. Let's go through the key improvements on the MK3: Filament sensor: Prusa now includes a laser … Unexpectedly, Prusa announced a significantly improved desktop 3D printer, the MK3. … announced a significantly improved desktop 3D printer, the MK3. Yes, we all expected Prusa to develop … MK3. Note that Prusa now says the maximum print speed on the MK3 is now 200mm/s, over the 100mm/s …

Question Of The Week: How Many Resin 3D Printers Exist?

Prusa itself is set to produce a resin machine shortly, so the ratio might be changing in the future … prusa … . We know from our discussions with Josef Prusa that his company could be producing nearly 160,000 … function, availability and cost. While some companies, like Prusa, are mostly dedicated to extrusion …

Thoughts On *Prusa's* New SL1 Resin 3D Printer

manufacturing the device and selling at a low cost to undercut Prusa Research. The only way to avoid … prusa … Thoughts on Prusa's New SL1 Resin 3D Printer … The new Prusa SL1 resin 3D printer, with cover open [Source: Prusa] Prusa Research announced a new … delivered by resin machines, and the different materials available. Prusa Research is not the first … resin-based 3D printer. What will this mean? I'm surprised and not surprised that Prusa Research is … relates to the design of the machine. Unlike Futur3D, Prusa Research will open source the machine … Prusa Research announced a new resin-based 3D printer. What will this mean? …

Surprise: *Prusa* Announces Resin 3D Printer, The SL1

time non-resin 3D printer manufacturer Prusa Research announced a resin 3D printer. The company has … based on that design. The secret to Prusa's success has been a combination of these elements: A … prusa … Long time non-resin 3D printer manufacturer Prusa Research announced a resin 3D printer. … company was producing upwards of 6,000 machines per month. In their recent announcement Josef Prusa … printers that use the filament extrusion process. Originally a unique design founder Josef Prusa … Surprise: Prusa Announces Resin 3D Printer, The SL1 … The new Prusa SL1 resin 3D printer, with its associated wash / cure station [Source: Prusa] Long …

A Caution For 3D Printer Startups: You're Too Late

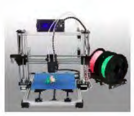
the operation. These steps each take up several large rooms in Prusa Research's manufacturing … prusa … A peek inside Prusa Research's operations should scare any wanna-be 3D printer startup [Source … Prusa Research takes to manufacture their machines. Steps include component storage, physical … below, is an informal tour of the Prusa Research manufacturing site, where that company produces … : 3DMN] After watching a video of Prusa Research headquarters, it's increasingly obvious that time is up … After watching a video of Prusa Research headquarters, it's increasingly obvious that time is up for new 3D printer startups. …

Implications Of The *Prusa* SL1 Resin 3D Printer

, given Prusa's propensity for large-scale sales. If the SL1 sells as well as Prusa's previous extrusion … We're nearing the release of Prusa's first resin-based 3D printer, and it's time to think about what this might mean. … prusa … Implications of the Prusa SL1 Resin 3D Printer … quantities. Enter Prusa Printers. This Czech company has come from nowhere a few years ago to today … enormous challenge, but if Prusa and other 3D printer manufacturers made machines sufficiently easy … The upcoming Prusa SL1 resin 3D printer [Source: Fabbaloo] We're nearing the release of Prusa's … become one of the largest in the industry. Now we see Prusa Printers coming out with a much more …

Prusa Research Ships 100,000 Machines

Prusa Research Ships 100,000 Machines … 3D printers, mostly the Prusa i3 printer. The Czech company celebrated their significant milestone … , and in particular their most recent device, the Prusa i3 MK3. It's conceivable they may have even … prusa … prusa-historical-machines - 1.jpg … Prusa Research has now officially sold more than 100,000 desktop 3D printers. … Prusa Research's all-time product line on display at their HQ, including the current Original Prusa … i3 MK3 printer [Source: YouTube] Prusa Research has now officially sold more than 100,000 desktop … actually over 130K machines at this point, powered mainly by their flagship device, the Prusa i3 … $prusa hits 100K machines …



The MaxMicron Auto-Leveling *Prusa* I3

capabilities - and especially it's price. The MaxMicron Prusa i3 is a kit that you must assemble yourself … Today we're looking at the MaxMicron Prusa i3 3D printer kit, and we're impressed with its capabilities - and especially it's price. … The MaxMicron Auto-

- *Leveling Prusa i3 ... Today we're looking at the MaxMicron Prusa i3 3D printer kit, and we're impressed with its ...*

What To Do With Thingiverse?

prusa ... alternatives, such as MyMiniFactory, YouMagine, Cults, SketchFab or the new PrusaPrinters site. [UPDATE ...

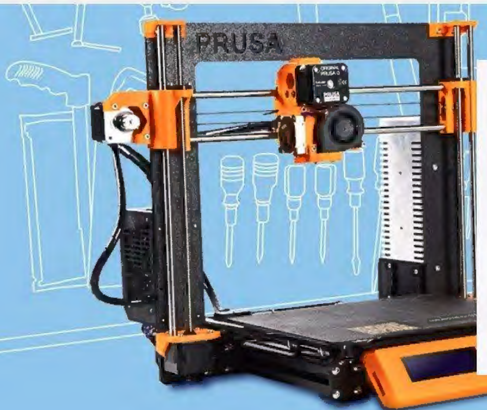
Thoughts From A Professional 3D Printer Maintenance Manager

printers are the entry level FDM machines, like the Prusa MK2.5S's and Ultimaker 2+ Extended. These ... prusa ... doesn't happen often. The Prusa's have the ability to print out replacement printer chassis parts! The ... fixing? Jeff Stobbe: For our Prusa's & Ultimaker, it is not unusual to replace nozzles & heat bed ...

More On The 3D Printer Hair Incident

prusa ... sequence: 2019-12-20 09:57:02 Operator is setting up a 3D print job on the Prusa MK2.5S on the left ...

See more



see it in 360

Prusa i3 MK2S

Last year the Prusa i3 MK2 topped the list as our best machine. This year we put the upgraded MK2S to the test, and it shared the No. 1 ranking.

Upgraded Hardware

One of the highlights of this machine is the bed and how it handles leveling. Before every print the MK2S runs a quick measurement of 9 points on the plate with the PINDA probe and adjusts the print in real time to compensate for any out of level or out of square measurements. The live z adjustment was our favorite feature of the calibration procedure — with a click and spin of the knob you can easily change the z height, and it actually remembers the setting.

One major improvement is the removal of the zip ties holding the bed in place. Metal U bolts hold the bearings in place, which greatly helps the overall rigidity of the machine and ensures that every time you go to print it's ready for you. Already own a Prusa i3 plus or MK2? Prusa Research offers upgrade options at a reasonable price.

Updated Software

The new slicer and machine control software, PrusaControl, is designed for someone who just wants to click and print. Those of you without dual extruders will enjoy the built-in filament color change feature: Simply use a slider to choose at what layer you want to swap and with a click of the mouse, a pause will be added to the print allowing you to easily change the filament manually. Want to dive in a bit deeper? Like its predecessors, the MK2S is open and gives you freedom.

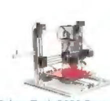
Proven Performance

With a genuine E3D V6 all-metal hot end you can print with virtually any filament — it can reach temperatures of up to 300°C. The E3D V6 is considered by many to be the best hot end on the market, and its inclusion in the Prusa MK2 line of printers is one of the reasons they rise to the top. And with the MK3 hitting the market, the MK2S' price has dropped $100, starting at $599 for the kit.

Related Stories from Make:

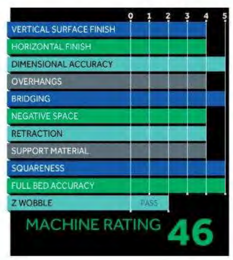
Prusa i3 MK3

Prusa i3 MK2



Folger Tech 2020 Prusa i3

HOW THIS SCORED



See Scoring Criteria

AWARDS
Best-Overall
Outstanding-Open-Source

By Chad Elish

Published: November 6, 2018

WHY TO BUY

The Prusa i3 MK2 was our top rated printer last year, and the MK2S upgrades made the best better. A price drop when the MK3 was released just sweetens the deal.

Buy Now

PRO TIPS

If you're having issues with prints not sticking to the bed, wipe it off with alcohol, run a z calibration, and use the live z adjustment.

mElephant

Specs

Prusa i3 MK2S

Prusa Research

MANUFACTURER:	Prusa Research
PRICE AS TESTED:	$899 ($599 kit)
BUILD VOLUME:	250×210×200mm
BED STYLE:	Heated with PEI print surface
FILAMENT STYLE:	1.75mm
OPEN FILAMENT:	Yes
TEMP CONTROL:	Yes, extruder (300°C max); bed (120°C max)
PRINT UNTETHERED:	Yes, SD card
ONBOARD CONTROLS:	Yes, clickable scroll wheel with LCD
HOST/SLICER SOFTWARE:	PrusaControl and custom Prusa Slic3r
OS:	Mac, Windows, Linux
FIRMWARE:	Marlin
OPEN SOFTWARE:	Yes, GNU GPLv3
OPEN HARDWARE:	Yes, GNU GPLv3

The Latest on 3D Printing

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Please see the evidence attached in the argument section of this response.