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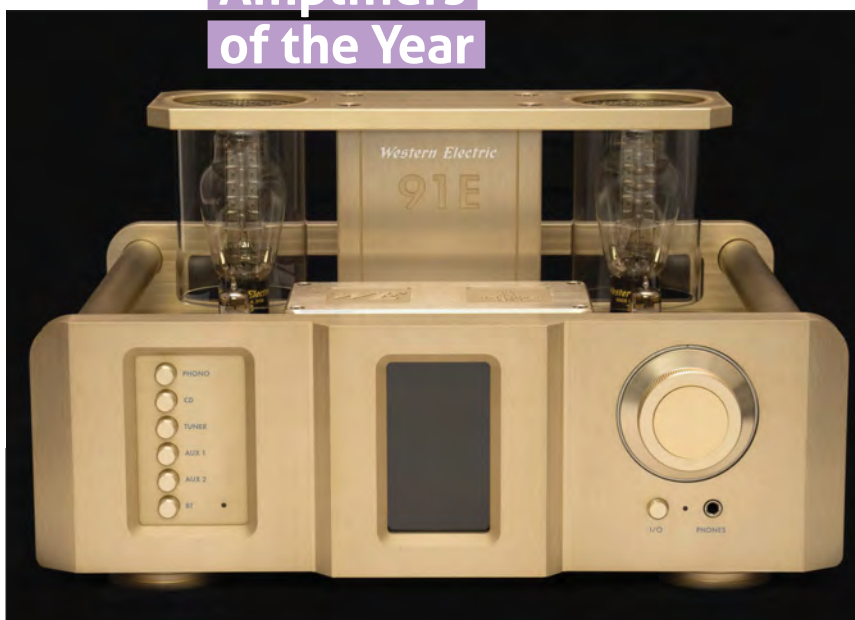


## Rogue Audio Cronus Magnum III

**\$3495**

In the conclusion to his original review, WG pondered if just possibly Rogue's Cronus Magnum III might join the pantheon of classics such as the original Quad or Audio Research SP6—models that delivered enough musical pleasure to outweigh any shortcomings. Designed by Rogue's owner Mark O'Brien, the all-tube circuitry of the Cronus Magnum III features an upgraded triode preamp coupled with Rogue's Atlas Magnum power-amp circuit. The III version also sports an improved array of component parts, a larger power supply, plus lower-noise low-voltage supplies for the discrete headphone circuit and phono section, which now accepts both mm and mc cartridges. Given its relatively moderate price point, everything about the design—its build, its fit and finish—is first-rate. Moreover, though you'll want to check the output tubes' bias now and again (which is easily accomplished), the unit is not at all fussy. As to the sound, the Cronus Magnum III delivers big time. Highly musical overall, it's warm but not fat sounding; it's airy; its resolution is plenty satisfying; it can rock; it's fun to listen to; and simply put, it is very, very good. The Magnum III's is not a "wow" kind of sound but rather a "*pull you into the music*" kind of sound. As with the original Magnum, the III does overlay a fine granular texture to the music, but it isn't a major impediment to musical enjoyment. In short, this is a more than worthy Product of the Year Award winner. (333)

## Tube Integrated Amplifiers of the Year



## Western Electric 91E

**\$14,999**

The Western Electric 91E is a unique combination of "old and new." The heart of the unit is the WE 300B tube, which is made—right here in the U.S.A. by WE—to the same standards and specifications as the original WE 300B tube, with some enhancements to the manufacturing process that increase the tube's longevity. The amplifier also blends an old circuit design (Class A2) for driving the grid of the tube with new innovative circuits like the patented SCCS (Steered Constant Current Source). Reviewer RB found the result to be nothing short of magical. Leading-edge designs like the 91E are not just hyperbole. They deliver real benefits, such as 20 watts of power from a 300B in single-ended triode (SET) mode. The 91E offers all the sonic benefits of the 300B without the shortcomings: well-controlled bass, a wonderful top end, and a five-year warranty on the pair of 300B tubes. It is refreshing to see tubes being made in the U.S. again. What's even more impressive is the commitment Charles Whitner, WE's CEO, has made to quality and execution. This unit is groundbreaking. It delivers an incredibly high standard at a relatively affordable price. RB was so impressed he purchased the review sample and listens to it daily. (Reviewed this issue)

2022  
the absolute sound  
**PRODUCT  
OF THE  
YEAR**  
AWARD

"[The 91E] has real innovation in design that is not hype. It is delivering sound quality beyond what I've previously heard from any 300B amplifier."

- Rives Bird, *The Absolute Sound*, Jan 2023



MADE IN  
USA

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**Western Electric**  
MAKER OF ELECTRON TUBES AND HIGH FIDELITY

[westernelectric.com/91e](https://westernelectric.com/91e)

# Equipment Report



## Western Electric 91E Integrated Amplifier

Tubes Made in the U.S.A.

Rives Bird

**I** must confess that I am biased toward tubes (pun intended). I've owned several tube-based amps, preamps, and phonostages. There is something that has always drawn me to their sound. Tubes seem to capture musicality in a way that their solid-state counterparts often don't quite equal. My favorite amplification tube is the 300B. Though not without limitations, it has a wonderful, lush sound that pulls me into the music. I have monoblock amplifiers for my reference system that are based on this tube. Those familiar with the 300B would probably stereotype it as possessing a full, blooming midrange with an overly polite top end and a lack of control and dynamics in the bottom end. I would have to agree that's a characteristic description; however, if you've ever wanted the benefits of the 300B without its shortcomings, read on.

When Robert Harley initially asked me if I would like to review the 91E, I had to decline, because the 91E was just too good an integrated amplifier to adequately review in what was then my second system, and there was no practical way of using an integrated amp in my main system. Having recently moved to an apartment, my main (and only) system can now accommodate an integrated amplifier and is worthy of this level of hardware. At

this point, I happily said yes to Robert and, wow, am I glad I did.

### A Bit about 300B Tubes

The first 300B tubes were made by Western Electric (WE) in 1938. The tube was in continuous production for 50 years, but in 1988 that came to a halt. These tubes were highly desired when they were in production, but particularly so after production ceased—some WE NOS 300Bs were fetching thousands of dollars apiece. I have had experience with many 300Bs from Shuguang, Genelex, JJ, and Electro Harmonix, but have not had the pleasure of listening to Western Electrics even though production resumed

in 1997. These new tubes are faithful reissues, but built to a much higher standard of manufacturing and performance. While not inexpensive at \$1495 a matched pair, they are not stratospherically priced the way many NOS tubes are these days.

I have ample experience with 300Bs in general and love their sound. But I was never willing to pay for an NOS pair of WEs. Most new 300B tubes sell in the neighborhood of \$150 to \$220 per tube. So, one would immediately wonder why the new WE tubes are so expensive relative to their competition. There was a significant sound quality difference among the previous tubes I tried, but sadly the ones I preferred failed on numerous occasions. (I bought four tubes at one point and had to replace all of them within six months. Two were within their 90-day warranty period; two were not. I no longer buy this brand of tube because it's just too expensive to replace the tubes so frequently, not to mention the hassle.) This is where WE really sets itself apart by offering a five-year warranty. That's unheard of for tubes and particularly surprising for a power tube. The CEO of Western Electric, Charles Whitener, told me that he has customers who still have tubes in service from his first production run in 1997. That is over 20 years running!

### A Bit about the "New" Western Electric

Charles Whitener had sold a previous company in another industry successfully and was on the hunt for something new. He was passionate about high-end audio and noted the

# Equipment Report Western Electric 91E Integrated Amplifier

## Specs & Pricing

**Power output:** 20Wpc into 8 or 4 ohms

**Inputs:** Six line, one phono (all RCA), Bluetooth v4.2

**Outputs:** Speaker level on binding posts, preamplifier out, line out (all RCA)

**Tube complement:** ECC81 (preamplifier), one pair Western Electric 300B (output)

**Dimensions:** 18.9" x 15" x 11.1"

**Weight:** 49 lbs. (shipping weight 94 lbs.)

**Price:** \$14,999 (black or champagne), \$15,999 (nickel)

### WESTERN ELECTRIC

201 West Gordon Ave  
Rossville, GA 30741  
(404) 352-2000  
westernelectric.com

rising prices of 300Bs. He viewed this as an opportunity and looked for a way to faithfully bring back the WE 300B. First, he had to buy the naming and technology rights from AT&T (the last owners of Western Electric). It took a long time and many attempts to finally get AT&T to agree. In 1992, he started the revival. For his staff, he used people who had been with WE previously, working in the original plant. With this expertise and infrastructure, the pathway was clear. But, as any entrepreneur will tell you, there are always unexpected challenges. For the new WE, glass was the issue. Unfortunately, the new company lost a key employee who knew how to make the glass. This delayed the first release until 1997. After that, WE assumed it would be smooth sailing, but that was not the case. AT&T sold its WE plant to an investor, who turned the building into office space. The new WE lost its lease in 2002 and moved to Huntsville, Alabama. A similar issue occurred in this location, and in 2016 WE moved to Roseville, Georgia, and has been there since. (See the Factory Tour sidebar.)

In a chat with Charles, he described the design goals of the 91E very clearly. He wanted the lush sound that is so characteristic of the 300B but without the shortcomings. His desire was for

it to sound good from top to bottom, with low hysteresis. He described the challenges in achieving this goal with single-ended topology, which generally needs massive transformers that by their very nature are going to have significant hysteresis. Additionally, Charles wanted an ultra-low noise floor, which is a challenge for single-ended tubes and particularly for a 300B, which has a directly heated filament.

As you might expect, Charles would not have told me about his goals had he not already achieved them, so I'll spare you the suspense. The question remains, how is it possible? There are some unique parts of the design that made Charles' goals attainable. One was running the tubes in Class A2. The A2 design is essentially Class A that drives the grid of the tubes a little higher, delivering greater output. This gain strategy is actually not new at all; in fact, the basic circuit design is quite old. But, to my knowledge there isn't any other 300B amplifier using it. The second and patented portion of the design is the Steered Constant Current Source or SCCS. The basic idea of this patent is to increase the current on the basis of the load at the output terminal. Thus, if the load

increases so does the current, and if the load decreases so does the current. A third interesting design parameter is the transformer itself. The A2 and SCCS allow for a smaller and lighter transformer, which helped meet Charles' design goal of reduced hysteresis. The transformer is also unique in that it lacks the usual multiple taps for various impedance loads. There is just one set of binding posts; to change the nominal impedance the transformer needs to be swapped out. This is actually very easy to do because of the way the 91E is designed. Though it ships with whatever nominal impedance the original buyer specifies, it's nice to know that if you switch speakers and need to make this change, the swap is relatively straightforward and reasonably priced at \$999 for a second transformer. (According to Charles extra taps on the transformer degrade sonics, so he opted for perhaps a simpler, albeit more expensive approach to favor the best possible sound.)

The result is a reliable single-ended 300B integrated amplifier with double the output power (around 18–20 watts) that what one would normally expect. Yes, Charles achieved his technical goals, but the real proof is just how good this integrated sounds.

### Initial Setup

The 91E has six single-ended analog inputs, including a phono input that can be changed from mm to mc via a switch on the back panel. I currently do not have a phono system set up, so I was not able to test the phono stage. There is also a Bluetooth antenna and connection. This was a little surprising to me,



# Equipment Report Western Electric 91E Integrated Amplifier

as Bluetooth audio quality is limited and certainly not up to the sonics of the rest of this product. Nevertheless, I wound up really liking the feature because I was able to connect my TV to the 91E via Bluetooth. No surprise that it was infinitely better than the integrated TV speakers. There are three outputs: the standard speaker binding posts, a line-level output, and a preamp output.

Installing the 300Bs is a little tricky in that you must open the “chimney” that houses the tubes. A ring that can be rotated holds down a glass cylinder and grate. The ring is rotated slightly counterclockwise using a red-colored spanner tool included in the accessories. The instructions could be a little clearer in this area. There is more than one spanner tool, so a drawing that shows which spanner and just how the “chimney” is opened would have helped. Each of the tubes was labeled, one for the right channel and one for the left channel. While the tubes are matched, they have slightly different gains. Each amplifier is calibrated for the tubes that will be used in it. The preamp section’s ECC81 tubes are installed at the factory.

The unit had been broken in for a day at the factory, but I felt it probably needed additional time. I expected I would need to bias the tubes as well over the first few days, but I was pleased to discover the 91E is auto biasing. The tubes are biased each time the amplifier is turned on. It takes about 30 seconds to warm up, then 30 seconds to monitor and bias the tubes. The microcontroller in the 91E uses an analog-to-digital converter to sample the plate voltage and current and then adjust the grid voltage to the correct value. Tubes will drift over time, so this is a great feature. I would have liked to know what kind of drift was occurring, particularly in the first week or so, but there is no feedback to the user as to what the bias settings are. I expect that the WEs drift less than some other makes of 300B, but I have no way of knowing for certain.

## Initial Listening

At first listen, I could tell there was need for some break-in. There was a little harshness and imbalance, which I expected. I figured it would take a couple of weeks to get the best sound from the 91E. To my surprise, the break-in seemed to be complete in a matter of hours, rather than days or weeks.

Being very familiar with the 300B sound, I had to start with a series of vocals. Roon was kind enough to mix a Holly Cole playlist for me, which also included Jane Monheit and Melody Gardot, among many more of my favorites. This was a perfect starting point and, wow, did the amp sound good without any substantial break-in. I was cooking dinner while casually listening and was already impressed. My wife even commented on how good it sounded. She would not call herself an audiophile, but she has gotten a little spoiled by good sound. It was immediately obvious to her, as it was to me, that this was, indeed, a very special piece of audio gear.

## Curiosity

Having owned many tube amps and preamps I’ve learned how much sonic change can occur by changing tubes. It’s usually fun, but sometimes it can be frustrating. I have a nice collection of 300Bs, though they are in storage. I did think about digging them

out and seeing just how much of the sound quality I was enjoying was a result of the WE tubes and how much was owed to the 91E. But in the manual, there is a clear warning: “The 91E was designed for operation with Western Electric manufactured 300B electron tubes. The application of non-original or replica-type 300B tubes may result in weakened performance, distorted sound, or unexpected behavior, potentially harming both the amplifier and said replica tubes.”

As a reviewer, I felt it necessary to heed this warning. I’m sure the sound is a combination of both an outstanding tube and a circuit that seems to be purpose-built for the WE glass. Although I’ll likely never really know the answer to the question I posed, I won’t lose any sleep over it. The 91E sounds so incredibly good, who cares?

## Serious Listening

When you hear a system come together and really gel, it no longer sounds like a combination of various pieces of audio equipment attempting to faithfully reproduce music; it sounds like the real thing. The equipment gets out of the way, and it becomes all about the music. How the textures of a saxophone that resonate all the way from the reed to the horn take on the three-dimensional quality of the real instrument, or how a vocal feels as if the singer were leaning over and whispering in your ear, like he or she were actually present in the room. I was already experiencing this with the 91E, and I was just getting started.

The WE’s output power of around 20 watts is well suited for my very efficient (94dB)

speakers, which also present an easy load to drive. Nominal impedance is 4 ohms. The actual impedance across the audible frequencies varies from 2 ohms to 14 ohms. This is a tube-friendly pair of speakers. (This is not true for all speakers, so keep in mind that difficult-to-drive loads may not fare as well.)

I continued with more female vocals and jazz, which is mostly what I listen to anyway. Every track I played just made me want to play more. I could listen to this amp for hours, and on the first day of installation I did. And while vocals and jazz sounded the best I had heard on my system, I wanted to see how other musical genres performed. A system that can only play one type of music well is far too limited for my musical tastes.

Starting off easy but still providing slightly more of a challenge, I wanted to see how the drum solo in Dave Brubeck’s *Take 5* fared. The drums are dynamic but also have a great deal of subtle texture to them (the weight of the drum strokes vary, and the drumheads’ tone is well pronounced). The 91E captured this as well as I’d ever heard it. So, that just naturally led me to see how well the 91E could handle John Bonham on the drums. I personally like the older Led Zeppelin; *I and II* are my go-to albums. Christopher Huston, who I worked with at Rives Audio for many years, recorded *Led Zeppelin II* and was often asked how he got the sound of those drums, as it really is spectacular. Chris is incredibly humble and would frequently respond: “I didn’t. John Bonham did. I just documented it.” He later told me he re-

# Equipment Report

## Western Electric 91E Integrated Amplifier



corded the drums with only three microphones. Three microphones? Now, that is truly amazing! It is safe to say the WE 91E reproduced everything Chris Huston “documented,” and it was magical. It captured the speed and pure raw dynamics of that unique sound John Bonham was famous for!

I wanted to continue to steer toward more and more difficult types of music to challenge this amplifier. Dead Can Dance’s “Yugula” is an excellently recorded piece from the band’s *Into the Labyrinth*. It runs the full tonal range, from very low bass to more subtle vocals, keyboards, chimes, and sounds that give a sense of space to the composition. All these subtle tones can be lost, and in some cases the depth of the lowest frequencies is often rolled off, reducing the breadth of the soundstage. With the 91E, I was pleased with everything I heard. It felt like the low frequencies were all there, while the subtle overlays almost floated in space, with more dimensionality than I was accustomed to. Everything I was throwing at this integrated amp was seemingly too easy for it.

Several days later I decided to see if I could find the limits of the amp with Foo Fighters’ *Medicine at Midnight*. Here, the amp sounded a bit strained and compressed, and the bottom end thinned out. I then played Eiji Ovi *Mephisto and Co.*, a superb Reference Recording. On really large, dynamic passages, of which there are many, I heard the same thing—a bit of strain and compression and a thinning of the bottom octaves. Because these pieces were so much more challenging from a scale and dynamics standpoint, I thought that the 20 watts of these 300Bs had finally found their limits. But I was wrong.

A few days passed, and I continued to be impressed with this integrated. I found myself scratching my head about what I had heard earlier. There was just no strain or compression on what I was listening to at this point, and I couldn’t believe that those two albums I tested sounded the way they did. So, I went back to both, and (now) they sounded fantastic. There was no strain, no compression, and a full bottom end. Not only was the bot-

tom end full, but it was also well controlled and far better than I’ve ever heard from a 300B amplifier. Additionally, all the mid and upper-end frequencies remained intact throughout these challenging passages. I suspect this has a lot to do with the SCCS technology, since the wide voltage swings that often occur for lower frequencies can create havoc with the current being delivered. After a bit more experimenting, it became clear that this amp needs more warming up for each listening session than I had originally allowed. Sufficient warmup—around 45 minutes—results in a much bigger sonic difference than I’ve heard with most amps. It’s almost like a switch, where the amp locks in and decides it’s game time. Since I generally let the equipment warm up without listening seriously for a while, I did not really appreciate just how important this warm-up period was with the 91E. Now that I know this, it’s really not an issue to me. But if you are auditioning this integrated, be

sure to let it warm up amply before passing judgment.

One portion of my listening was with a few Edgar Meyer albums. These included Edgar Meyer and Chris Thile *Uncommon Ritual*, *Appalachian Waltz*, and *Short Trip Home*. Edgar Meyer’s bass playing is wonderful, and many of these albums are just plain fun. The contrast of sounds, particularly with Chris Thile’s mandolin, was superbly reproduced—a delight to listen to. Both instruments were absolutely true to their character. This may not have been one of the most demanding tests, but it was enjoyable.

### Conclusion

The 91E is a very special product. It has real innovation in design that is not hype. It is delivering sound quality beyond what I’ve previously heard from any 300B amplifier. The areas that it excels in redefined for me just how great some of the recordings I listened to are. The best sound I’ve achieved on this system was listening to jazz and vocals. The presentation was so organic and fluid that I just wanted to melt into the listening chair and listen for hours. The only time I was not impressed was when the amp wasn’t adequately warmed up, and that was my fault, not that of the equipment.

If you are in the market for an integrated tube amplifier and have ever been exposed to the beautiful sound that 300Bs can offer, the 91E is a must audition. And while not inexpensive at \$15k, I find it to be an extremely high value for what it delivers. I’m very happy WE is back and looking forward to more innovations. Very highly recommended!

# Equipment Report Western Electric 91E Integrated Amplifier



## Inside the Western Electric Tube Factory

**I VISITED WESTERN ELECTRIC'S NEW FACTORY**, located in an industrial area within Roseville, Georgia, just outside Chattanooga, Tennessee. The factory is an impressive 40,000 square feet of manufacturing space. It appeared that about one third of the main floor space was in active use at the time, while the remainder was in the process of gearing up for future production. Over \$4 million has been invested in the space, with some very expensive machinery, including laser welders for building the tubes.

Tubes and cartridges are two things in the audio world that have always struck me as being incredibly difficult to make at the highest level. Charles Whitener walked me through the entire process of making a 300B tube from start to finish. I have never visited a tube factory before and was fascinated at just how complex and detail-oriented tube building is.

The process starts with the filament. This is the component of the tube that glows when turned on; heating the filament causes the filament to emit a "cloud" of electrons into the vacuum. The filament material is proprietary to WE, as is the procedure to finish the filament which involves a combination of coatings and gases. The process allows a greater abundance of free electrons, thereby making the tube more efficient at producing sound. There is a

whole line dedicated to making just the filament wire, a key element of the tube and one of WE's trade secrets. We were not allowed to photograph it, but I can tell you that it's complex and has incredibly tight tolerances for consistency.

This is just the beginning of making a tube. In fact, there are over 50 steps to manufacturing a 300B. I won't be able to tell you all the steps, but I can describe the most interesting ones. The filament is cut, and an exterior coating removed so that the filament can be safely welded to the conductors. The cut filament is inserted into a jig that assures each filament is identical in length, pattern, and welds. The filament will ultimately go inside a frame of horizontal wires that form a mesh. The framework and horizontal wire system is made from scratch in-house with the precision of Swiss watchmaking (possibly even more precise).

The anode is also made from scratch using a proprietary metal. The metal is cut in-house by a stamper to a precise size and then pressed to form a specific shape. The sized and pressed pieces are then coated with graphene, using a proprietary method and combination of gases. (Even the graphene is made by Western Electric, which discovered the process somewhat by accident.)

As you might imagine, the external glass for the tube is critical and is the only part that Western Elec-



## Western Electric 91E Integrated Amplifier **Equipment Report**

tric does not make. It is sourced from Schott Glass in Germany. Since the glass must be free of all impurities, Western Electric makes its own deionized water to clean the tubes. (The factory has special dishwashers that spray the interior of the tubes with the deionized water.) The glass bulbs are then cleaned out with acetone and put through an ultrasonic bath with more deionized water. The deionized water at Western Electric is 18.5 megohms purity, meaning it functions almost as a pure insulator. To put this in perspective, typical distilled water is 500k ohms. This is laboratory-grade water.

The filament, anode, grid, and glass base are then assembled, with the tube's pins welded to the base using a system that ensures identical welds every time. This assembly is then put into the glass bulb and subjected to a series of processes that complete the 300B. First, there is leak detection, where a vacuum is held briefly to test the vacuum seal's integrity. Then the tubes are baked at 400° C to remove all moisture. The metal parts are treated with RF induction heating at 865° C. In this process, radio-frequency current is induced in the metal parts to produce heat, which bonds different metals and changes their properties. Finally, the glass tubulation is sealed at the top and a 300B is born.

Once the 300B is complete, the getter (a material that absorbs any stray gas molecules) is flashed to attract any remaining impurities to it. Then every 300B is burned in for nine hours under more extreme conditions than normal use. Any tubes with imperfections will fail quickly under these conditions and will be rejected.

I also visited the area where the 91E amplifiers are built. This

area was comparable to what I've seen at other high-end audio manufacturing facilities, and is far simpler and smaller than the tube-assembly section. What I could tell from this space, though, is that WE probably had no idea how many 91E orders it was going to get. The space for this production was already at capacity at the time of my visit.

I mentioned the other two-thirds of the open floor space that was not yet active. I saw equipment set up but not yet in use. Charles told us this area was the future production line for additional tubes. The early potential list includes the 12AX7, 6L6, 6SL7, EL34, KT88, and even 308B (a large tube capable of 200W in SET mode). The precise list of tubes is still speculative, although the 12AX7 will definitely be in the first production. Western Electric has good relationships with the guitar industry, which buys far more tubes than audiophiles.

It's this kind of market and demand that make the huge investment Charles has put into the factory worthwhile. His incredible attention to detail and ability to find new innovative ways to make improvements both in sonic quality and longevity have successfully brought Western Electric back to the audio world. The quality control in this factory is astounding and validated by Western Electric's five-year warranty on all its tubes. You can see the entire tube-building process in an excellent video on Western Electric's website.

It's great to have tubes back in the U.S.A. I plan to keep the 91E, and I expect I'll be buying some of the new varieties of tubes from Western Electric's Georgia factory in the future. **tas**

