



The

Squeaky Wheel



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WONDERFUL WORLD OF ENGINEERING

To celebrate the wonderful world of engineers, in this issue of the Squeaky Wheel we've chosen to highlight some of our favourite engineering feats and topics.

Architectural Engineers

The pantheon – this dome was engineered almost 2,000 years ago, and it's still the largest of its kind today. The Pantheon in Rome was designed by Apollo of Damascus in 120AD, with a giant 43m dome and huge oculus. For centuries, engineers tried to replicate Apollo's architectural achievement – which was to create a huge dome with a diameter exactly equal to its height.



The perfectly proportioned dome has influenced architecture for centuries, but it's never been surpassed. The Pantheon's dome was the largest in the world for 1,300 years, and is still the largest unsupported dome today.

Mechanical Engineers

Well here the sky (or even space) is the limit. Too numerous to mention them all and too even to pick a single object, where do we start? The pyramids? No, architectural has a mention more significant. Roman hypocausts? Aqueducts? Or steam engines - there's a good one. Or is it pumps? Maybe the essential sewage systems or internal combustion engines, ships, aeroplanes, cars? All of these come from that root of mechanical engineering. But possibly that most efficient of man's machines, providing freedom of movement at speed over distance, is the winner – the modest and unassuming bicycle which awakened a new age of thinking. Now Steam... there's a subject requiring much more thought. In the meanwhile we have a picture of the first recorded bicycle - the Johnson Bicycle of 200 years ago.



Biomedical Engineers

Our next contender also has roots in the past - human prosthetics. One of the oldest examples is a wood and leather prosthetic toe found on a 3,000-year old Egyptian mummy – created by one of the first biomedical engineers. Since then, biomedical engineering has evolved hugely and completely transformed modern medicine. Think about surgical devices, MRI scanners, dialysis machines, bionic nerve propelled limbs – all of these life-saving technologies have been developed by biomedical engineers.



Computing Engineers

Computers and computing started around five thousand years ago with the ABACUS in Asia Minor, falling into disuse with the creation of paper, quill pen and ink. Computers were not really thought about again until the eighteenth century when Charles Babbage, an English scientist/mathematician, frustrated by mistakes made in astronomical calculations, designed a sophisticated calculating machine. Moving on from the original Babbage computer to the integrated artificial intelligence of today computing is improving moment by moment.

...And last but not least: the internet! The internet has changed day-to-day life. It's the world's largest library, shopping centre, video store and communication channel all rolled into one. It was originally created in 1969 by electrical engineers from the UCLA to Stanford University with TCP/IP protocols set up in 1974 by Bob Khan and Vince Cerf (Cerfing the Net?).

The internet has transformed our lives – but even the internet has evolved since the early days. When it was first introduced, the web was used by a few expert coders to transfer data between two terminals. Only 40 years later, the internet is the largest computer network in the world, connected to four million systems, 70 million users, and a dizzying number of opportunities – all thanks to engineers.

Electrical Engineers

In distant 1791, Michael Faraday did not receive a traditional scientific education. He became an apprentice to a bookbinder where he learned about scientific subjects from the books he bound. As he gained an interest in science he started to attend scientific lectures. He was especially interested in electricity, galvanism, and mechanics. Eventually he attended four lectures given by Humphry Davy, which marked the start of his scientific career.

In 1814, Faraday travelled with Davy throughout Europe for 18 months, meeting many scientists and developing his scientific knowledge along the way. Upon his return, he worked with Davy on chemical experiments for several years before he published his research on electromagnetic rotation in 1821, which is the principle behind all electric motors. This moment, perhaps, was the birth of the electrical engineering discipline.

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SPOTLIGHT ON MOTAT'S ORAL HISTORIES

Not generally well known is MOTAT's considerable and growing oral history repository. Over the last twenty years the Walsh Memorial Library has been developing its collection of oral histories.

The library has over 400 hours of recordings archived, covering themes of aviation, transport, telecommunications, and more. Interviews with former MOTAT volunteers and staff members and others give an intimate and lively account of the museum and stories about our collections.

Members of the MOTAT Society are welcome to visit the library and listen to interviews. For this issue of *Squeaky Wheel*, we feature excerpts transcribed from two of these histories which we hope will give you a taste of what is available.

We have chosen an interview with Graham Voitre who worked with Auckland Tramways (and later Auckland's bus services) for over 40 years. The other is from one of our valued volunteers, Nola Morgan, who spent many years working with her husband in the Pioneer (Victorian) Village.

The MOTAT Library is open Monday to Friday 10am – 4pm (except public holidays). Contact via phone 09 845 3690 or email library@motat.org.nz.

GRAHAM VOITRE - THE MAN WHO PAINTED THE LAST TRAM

Graham Voitre started work at the ATB (Auckland Transport Board) in 1948 as a 15 year old apprentice coach painter. Initially addressed simply as "the boy" Graham started out earning 28 and sixpence working from 7:30am to 4:00pm in a five year/5000hr apprenticeship. He worked his way up through the paint shop ranks to foreman in 44 years of service to Auckland's public transport system.

"I was apprenticed as a coach painter, which was an old fashioned term. Some call them a body painter but look, yeah a coach painter.

"My first year was doing all the menial tasks such as rubbing down, sweeping the floor. I became the lunch boy. I had to go from where we were [at] Manukau Road down to Royal Oak, pick up all the lunches and bring them back for the staff in the paint shop and the body shop. . . . after going through all the menial tasks - sweeping the floor, rubbing down, filling up the holes and sanding them back again - I then progressed to spray painting.



Above: Graham 6th from the left with colleagues in front of Tram No.253 "Queen Mary". Photo courtesy of Graham Voitre.

"Even though as I said we used to rub down mainly by hand we did have sanding machines. But we weren't impressed by them really. It was the later models that later on were quite good but the early models, they didn't help that much.

"After the tram was sanded down it took about six weeks to paint. . . . We had a small booth where we spray painted all the small items that belonged to the tram car, such as the seats and the seat backs, and the window frames.

"All the windows were taken out of the tram by the way. And they had a . . . steel plate went inside the frame so we could spray the frames without getting paint onto the glass. And after everything was spray painted . . . the windows were cleaned in the old-fashioned way. They were cleaned with a pad about a half an inch thick . . . And you used to put pumice on and put the pad onto the glass, clean the glass until they looked like brand new.

"[W]hen the trams were painted they were taken out to the outside where there was a pit . . . And they used to drive the tram onto this traverser - which was a platform on wheels which used to run down between the two buildings. But because we didn't have a spray booth big enough to take the trams everything was spray painted outside, which wouldn't be tolerated today.

"The panels on the tram were mostly kauri ply and sometimes we used to put metal panels on them like aluminium. And the undercoat was spray painted outside, maybe six or seven coats of paint. And then we put on a guide coat, which was a thin yellow paint, very turpsey transparent but enough to show that we had sanded down enough to get a flat finish.

"Everything was rubbed down by hand. The panels which were spray painted . . . Mostly they were the rubbed down wet and as I said your hands softened and sometimes started to bleed. Inside the tram the panels were ply . . . and they were spray painted and filled up. And they came up like glass afterwards. The . . . seats were all done separate.

"The roof was covered in like a canvas and we used to make up an oil based paint from white lead which we used to mix up by ourselves. It contained the white lead, turps, terrabin - which is a dryer, and oil - I think it was linseed oil. And that was all mixed together and took ages to mix it up. . . . [W]e tinted it light grey with a bit of black. And we then painted the roof by hand . . . And then it was taken back on the traverser again at the end and all the chassis . . . was painted black."

Graham emphasised that in 1948 "[W]e weren't with the times . . . and the trams were painted by brush". Brushes used were the best quality Hamilton brushes stocked by their own on-site store and paint pots were made on site at the Blacksmith shop.

"Yeah everything was painted by hand other than the spray-painting outside. It was all brush painted. . . . It was all lead and super enamel. Although later on when we got to doing buses special paint was brought in from England which was very superior paint.

"[W]e all had our locker each where you kept your brushes. And you got used to using your own brushes. No one dared take your brushes and use them. . . . once they wore down you could go and see the foreman and he'd say 'Yeah well go up the store and get a new one.'"

Whilst lines were hand painted with a steady hand and a suitably sized brush, ATB logos and the destination blinds were all painted using stencils:

"Yeah, yeah the ATB was done like imitation gold. We used to make a paint up near enough to [a] goldy colour. And they used to put ATB in the middle and on each end they used to put the number of the tram. All the destination blinds were checked over by . . . another person at the end of the shop. . . . And he'd run through all the destinations because sometimes they would get torn and they'd get replaced.

"And they were sprayed with this oil black paint and then hung up on coat hangers to dry. Later on it became more modernised and for the

TOUR THE UNDERWORLD

Fort Stony Batter, Waiheke Island

Stuck for something to do?

Fort Stony Batter continues to operate its guided tours under CV19 Protection Framework observations. Explore this historic WWII Coastal Defence complex and learn its subterranean secrets.

Want To Know More?

~Visit the Fort Stony Batter website: www.stonybattertunnels.nz/

~Read the account of The MOTAT Society's April 2021 excursion to Fort Stony Batter on the MOTAT Society website: www.motatsociety.org.nz/post/society-trip-to-fort-stony-batter



buses and that we silk screened them.”

THE GOLDEN JUBILEE TRAM

Early on in his apprenticeship, whilst under the wing of a senior coach painter well versed in sign-writing, Graham assisted in the painting of the No. 11 Tram for the 50th Jubilee of trams in Auckland in November, 1952. One of the first trams to arrive as a kitset in 1902 for Auckland's new tram system, No. 11 worked the tram circuit for over 50 years, retiring from service in 1954, has since been restored and is currently in operation at MOTAT.¹

“[W]e did everything bar . . . the outline of the persons on the window. We did all the painting and all those little scrolls . . . We did all the scrolls and the curtains and such work, the poles. We had to make the poles like a barber's pole which was – we had to work that out how to do it but it turned out quite successful.”

I AM THE LAST TRAM

Perhaps Graham's biggest on-the-job claim to fame was his painting of the “Last Tram”, No. 242, which made the final Auckland tram run on 29 December 1956 with Graham's “I AM THE LAST TRAM” emblazoned on its side.



Above: Graham painting the iconic “I Am The Last Tram” slogan on No. 242. Photo courtesy of Graham Voitre.

“That was my foreman sent me over to do that. And he said he just wanted to make it rough . . . and ‘It's the last tram,’ . . . it was all done by just a big paintbrush virtually. He just told me to make it as rough as anything . . . ‘Because they're getting rid of it. Getting rid of this tram.’”

James Duncan gives more insight into what became of No. 242 in his article about No. 253 - nicknamed “Queen Mary” - published in the electronic version of Squeaky Wheel #40, June 2021.

“During early 1957 each of the remaining 43 trams was driven the 1.5 kms down the road from Epsom Depot to the Royal Oak Manukau Road Workshops. Here, once stripped of seats, metalwork, control and running gear, a trucking company took the tram bodies down to Thames, where they then on-sold the bodies to become garden sheds, greenhouses or more commonly, holiday homes – baches!”²

NOLA MORGAN - MOTAT, A FAMILY AFFAIR

I don't think I will ever forget the highlight of my first visit to MOTAT as a child in the 1970s - The Lolly Shop. Shelves stacked high with glass jars filled to the brim with copious quantities of handmade sweets. Lollipops and gobstoppers strewn across trays spread on counter-tops and a pocket weighed down with coins. This was kid heaven!

Nola Morgan remembers The Lolly Shop fondly, a part of the heritage saturated Live Days at the MOTAT Colonial Village.

“. . . my youngest daughter used to be with another lady in the . . . lolly shop. And she would be in there selling the lollies. . . . one time

After discontinuation of tram services in Auckland No. 242 was used as a bach in the Whanganui region and was demolished in 2006.³

ATB BRANCHES OUT

Following the last Auckland tram runs, the paint shop moved onto the painting of the trolley buses that took over public transportation. In an effort to keep operational, services were extended to include a variety of tasks including track signs for the Botanical Gardens, the painting of houses owned by the ATB, and even the ATB office building.

“[W]e were all employed painting the interior. . . The whole paint shop went down there . . . Although one person fainted one day because he used the shellac which is methylated spirit based and he got caught by the fumes. He was in a small area and just about passed out.

“And he [management] was all for getting extra work. . . [R]ather than the mundane which we had painting tram after tram after tram. And he got all this varied work and well it's a pity that it all went unfortunately. We had over 130 apprentices. And that went right throughout the workshop to the treatment plant and Rockfield Road, the airport. . . And we had a man in charge . . . of all the apprentices and we used to have mechanics that . . . won the award with the competition they had and they were sent overseas to Germany. And they won prizes over there.

“We had the paint shop, the sign shop, body shop, a trim shop - . . . the buses had leather seats and so we had a trim shop . . . We had a panel shop . . . We had building maintenance, a plumber, fitting shop . . . A chassis shop which was the ones that did the tyres and all to do with the wheels and that sort of thing. A blacksmith, electronic shop – electrics, armature winders, assembly shop, an engine bay and a [unclear] cleaner.

THE SOCIAL CLUB

The ATM supported its workers in social and sporting endeavours and built a purpose built building for a large subsidised cafeteria.

“[W]e had a cricket team and we used to play during the summer. . . down at Waikaraka Park. . . I wasn't much of a cricketer, I used to be out in the field. My cousin was a bowler and a batsman . . . We had a few ring-ins. And that was a couple of my cousins and one of the friend's of my cousin's.”

“[W]e had fun and games at the workshop. . . we had the bowling club next door. . . At lunch time we'd go over there. At odd times there'd be competitions going there. . . then we used to have certain members that challenged each other to a game of bowls. And we also had indoor bowls inside the shop.”

Graham remained employed with the ATB through its 1989 change to the ARC and its 1990 change to The Yellow Bus Company, retiring in December 1992, prior to its change to Stagecoach, seeing out 44 and a half years in service.

References

¹Tram [No. 11 (B Type 'Combo')]

<https://collection.motat.nz/objects/28701/tram-no11-b-type-combo>

²MOTAT's Queen of the Rails: Duncan

<https://www.motatsociety.org.nz/post/motat-s-queen-of-the-rails>

³‘I Am the Last Tram’: Hutching

<https://medium.com/motat/i-am-the-last-tram-32921ce00dbc>

Graham Voitre et al. 23 Aug 2011. MOTAT oral history interview with Graham Voitre, 11-

3940. Walsh Memorial Library, the Museum of Transport and Technology (MOTAT).

<https://collection.motat.nz/objects/68600/motat-oral-history-interview-with-graham-voitre>

there was a man actually making the lollies. . . . People loved to watch that being made.”

Nola and her husband Ron were friends with Joyce and Ian Lush, founders of MOTAT and doyens of the Colonial Village. Joyce's call for Nola to share her sewing skills sparked the beginning of an involvement encompassing three generations.

“And at the top of our road there was Joyce and Ian Lush which we were very, very fond of and great friends with them. And Joyce said ‘Perhaps you'd like to come to MOTAT and do some sewing’ . . . I'd

Continued on page four...

RIDE THE RAILS Glen Afton Line Open Days

The Bush Tramway Club is anticipating a return to their open days, hopefully recommencing the first Sunday in April*. Ride the rails through charming scenery in vintage carriages moved by restored historic engines.

Want To Know More?

~*Visit the Bush Tramway Club website below for further information and Open Day updates www.bushtramwayclub.com/visitus.html.

~Read about the MOTAT Society's June 2021 excursion experience to the Bush Tramway Club www.motatsociety.org.nz/post/pukemiro-bush-tramway-club-visit



Nola Morgan - MOTAT A Family Affair...continued from page three.

always sewn for the children so sewing – I was passionate about that. So I said 'Yes, I would love to do that.' And they [my daughter and son-in-law] came and they did croquet. And [their daughter] was pushed around in the big pram.

“... my second daughter, got married at MOTAT . . . And that was just so nice because of the history of the child as a child coming through, getting married there, then bringing her children back and then they were at MOTAT as well...”

While Nola contributed her time helping with repairs to dolls and clothes, Village Live Days were the main event, dressing in self-made colonial costume and demonstrating how women of the colonial era lived.

“... the bodices were all lined and there was about four metres in the skirts. And we had lots and lots of lovely petticoats with all lace . . . And our little mop caps on our heads. And we really looked the part I felt.

“Yes and we wore the long pantaloons. . . .you'd lift your skirt up and there you've got all these petticoats. They wanted to touch them; they wanted to see them, who'd made them, where had they come from?

“... I may well be sewing, demonstrating different old sewing techniques that people like to see. . . I would probably be doing embroidery or perhaps I did a bit of weaving. . .

“And quite often in Willow [Cottage] I sat there . . . quiet and I was just reading . . . and there was a whole lot of [people] came in . . . And



Above: Nola & Ron Morgan in period costume. Photo: copyright MOTAT.

they said 'Oh look at this old girl,' and I said 'Hello.' And they would just 'Oh! Oh! Oh!' they said 'Oh we're sorry! We're sorry! We didn't know you were alive!' . . . All the others were dummies. All through the corridor and either side. Then when of course they came to me and I was sitting there quiet and dressed in the appropriate clothes they got a fright.”

Breadmaking was very popular with MOTAT visitors and Nola's husband Ron was often called upon to bake the bread on Live Days.

“[Ron] would go in and he would do the baking of the bread. . . And some of them had never seen bread made. . . and people would come and see the bread being made and say 'When will it be out?' 'Oh half an hour.' . . . And they would come back in half an hour and they'd all be waiting to see it either coming out or getting it cut up.

“But the fire itself was really tricky because you didn't sort of turn it on and say 'Well I'll have 150.' . . . But when the embers went down and they had the hand test and if you put your hand over it and you could feel it coming hot under your hand quickly it was exactly right.”



Above: Ron Morgan baking bread. Photo: copyright MOTAT.

Nola recalls that the Colonial Village Live Days at MOTAT were held around four times a year and were the highlight of her time with MOTAT.

References

Nola Morgan et al. 17 Sep 2004. MOTAT oral history interview with Nola Morgan, 07-510. Walsh Memorial Library, The Museum of Transport and Technology (MOTAT) <https://collection.motat.nz/objects/43392/motat-oral-history-interview-with-nola-morgan>

Wonderful World of Engineering...continued from page one

It took ten long years before Faraday did much more significant work with electricity. In 1831, he discovered electromagnetic induction, which is the principle behind the electric transformer and generator. He proved that a magnet could induce an electrical current in a wire, where he converted mechanical energy into electrical energy. This discovery showed that electricity had enormous potential for technological development. It didn't have to be confined to a lab any longer.

Faraday died in 1867, having made many contributions to the world of electricity. His work serves as the basis for electrical engineering, as the fundamental principles he discovered are still in use today.

Although the study of electricity was originally considered to be a part of physics, electrical engineering eventually branched into its own discipline. In 1883, the world's first School of Electrical Engineering was established at the Technische Universität Darmstadt in Germany.

Without our extraordinary engineers, the world, particularly our lifestyle in the western societies would be at a standstill - more diseases would be rife and our modern comfortable way of life impossible. So to keep productivity at an all-time high, we must ensure that we provide excellent training and invest in the next generation while at the same time recognising the past to inspire innovation. MOTAT can certainly continue to do this with our displays, both historic and contemporary, all

of which must continue inspiring and encouraging our young and not so young in an entertaining as well authoritative way.

by Henry Swan



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