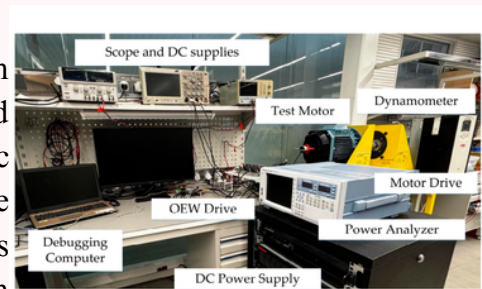


Research Bulletin

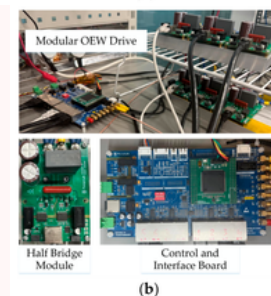
September 2026

UNBALANCED PHASE CURRENTS IN ELECTRIC MOTORS BALANCED WITHOUT THE NEED FOR PARAMETER ESTIMATION

Due to manufacturing tolerances and variations in winding configurations, differences in resistance and inductance may occur among the phases of electric motors. These differences can lead to unequal phase currents, reduced efficiency, and torque ripple. In this study, an open-end winding induction motor system, in which each phase is driven by a separate inverter, was investigated. A control method was developed to balance the phase currents without requiring estimation of the motor parameters. The proposed method was tested through computer simulations and laboratory experiments. The results showed that current imbalance was almost completely eliminated under different speed and load conditions.



(a)



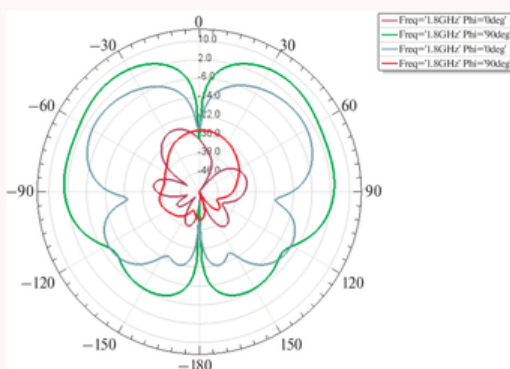
(b)



Tekgun, D., & Tekgun, B. (2026). Open-end winding induction machine drives under unbalanced phase impedances. *Machines*, 14(8), 909. <https://doi.org/10.3390/machines14080909>

GAIN ENHANCED AND POLARIZATION MODIFIED IN HELICAL ANTENNAS USING CYLINDRICAL METAL SIDEWALLS

The low gain of helical antennas used in wireless communication is known to be one of their limitations. In this study, cylindrical metal sidewalls were placed around a helical antenna operating at 1.8 GHz. The effects of the sidewalls on antenna gain and signal polarization were investigated through computer simulations. The addition of the sidewalls increased the antenna gain by approximately 2.7 dBi and altered the polarization characteristics. Measurements performed using two fabricated antennas showed a gain improvement consistent with the simulation results. The proposed structure was considered suitable for railway and road vehicle communication applications.



Durmuş, F., & Kılıç, V. T. (2026). Design and analysis of a helical antenna operating in normal-mode at 1.8 GHz with cylindrical side walls enabling polarization change and gain enhancement features. *Journal of Communications Technology and Electronics*, 71(4), 269–277. <https://doi.org/10.1134/S1064226925603988>

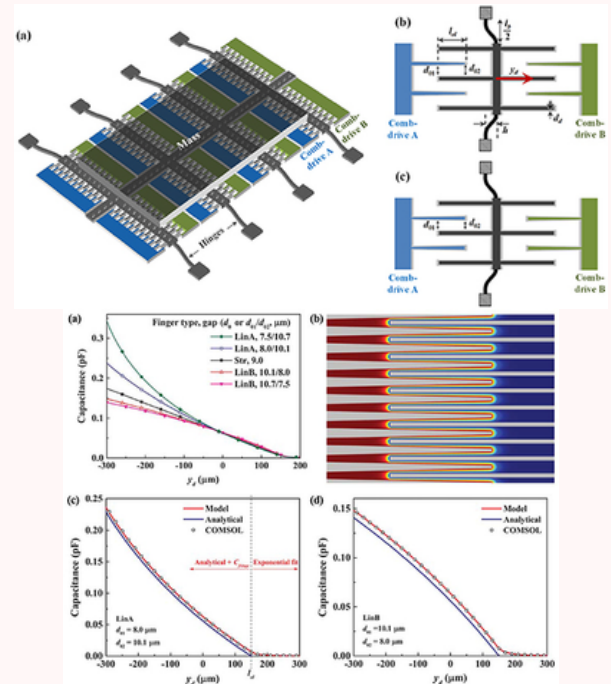


POWER ENHANCEMENT DEMONSTRATED IN VIBRATION ENERGY HARVESTERS THROUGH COMB-FINGER DESIGN

Harvesting energy from ambient vibrations is considered an alternative to batteries for low-power electronic devices, such as wearable sensors and implantable medical devices. In this study, the effects of comb-finger geometries on the generated power in electret-based vibration energy harvesters were investigated through computer simulations. Designs with gradually varying finger gaps were found to generate more power than the standard design. Under low-vibration conditions, the design with widening gaps increased the generated power by up to 2.45 times, while under high-vibration conditions, the design with narrowing gaps produced up to 11% more power.



Hah, D. (2026). Electret-based vibration energy harvesters with tapered comb fingers and curved-beam hinges. *Engineering Research Express*, 8(18), 185326. <https://doi.org/10.1088/2631-8695/aea8d9>



SOURCE OF THE GAIN PROVIDED BY PHOTONIC LANTERNS IN WIRELESS OPTICAL COMMUNICATION EXPLAINED THROUGH MODELING

In wireless optical communication, power losses may occur when light received through free space is coupled into a single-mode optical fiber. In this study, the receiver performance of a structure known as a photonic lantern, which distributes light into multiple fiber branches, was modeled computationally. A collection gain of 7.9 dB was calculated at a distance of 0.5 meters, and this gain was found to arise largely from a mismatch in beam size. Combining the signals from the individual branches was shown to reduce the probability of deep signal fading by several times. A measurement protocol incorporating testable predictions was proposed for experimental validation of the model.

Table 1
Model parameters used in the numerical analysis.

Parameter	Symbol	Value	Origin
Wavelength	λ	1550 nm	fixed (Ozdur et al., 2013)
Lantern single-mode ports	N	19	fixed (Ozdur et al., 2013)
Multimode core radius	a	25 μm	fixed (Ozdur et al., 2013)
Multimode numerical aperture	NA	0.22	fixed (Ozdur et al., 2013)
Baseline insertion loss	L_0	1.3 dB	fixed (Ozdur et al., 2013)
Effective aperture size	D_{ap}	2.1 mm	fixed
Fraunhofer distance	d_F	5.69 m	$2D_{ap}^2/\lambda$
SMF mode-field radius	w_0	5.2 μm	fixed (SMF-28)
Effective focal length	f_{eff}	10 mm	fixed
SMF spot-growth exponent	p_{smf}	1.0	fixed a priori
MMF spot-growth exponent	p_{mmf}	0.5	fixed a priori
Focused excitation factor	κ_{loc}	0.15	fixed
Speckle correlation length	ℓ_{cor}	8.0 μm	calibrated
Mode-excitation rate	C_M	10	calibrated
Wavefront curvature factor	γ_{curv}	6	calibrated
Correlation model	$\rho_0, \rho_{01}, \rho_{02}, \rho_{12}$	0.55, 0.05, 1	assumed
	p	m, 2	

Oran, A. (2026). Physics-informed modeling of photonic lantern collection gain and diversity in free-space optical reception. *Results in Optics*, 25, 101173. <https://doi.org/10.1016/j.rso.2026.101173>



A METHOD PROPOSED FOR DEVELOPING RESEARCH TOOLS WITH AI WITHOUT CODING

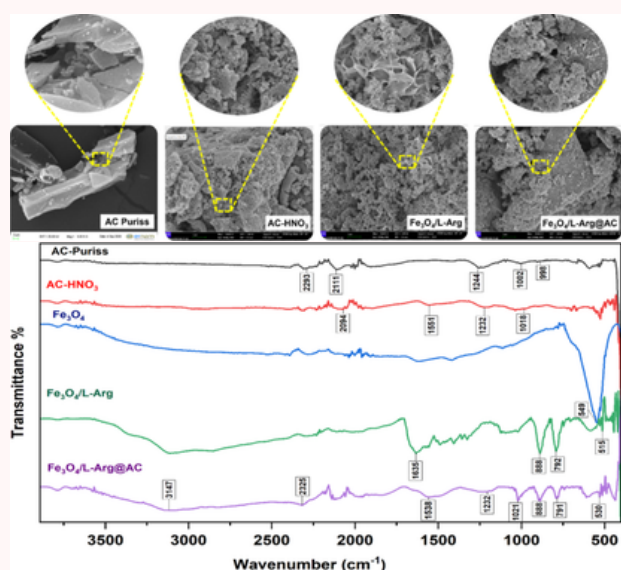
Developing digital tools for language research often requires programming knowledge, considerable time, and financial resources. In this study, “vibecoding,” an approach to software development through natural-language interaction with artificial intelligence, was presented as a structured method for developing research tools. The method was described in eight stages using VetLingua, a tool developed for learning academic English in the field of veterinary medicine, as a case study. The study emphasized that prompts given to AI should be documented and justified to ensure research transparency and reproducibility. It was noted that the method was defined for the first time and requires validation in different contexts.



Crosthwaite, P., & Özer, M. (2026). Vibecoding as method: A structured workflow for AI-assisted research instrument development in applied linguistics. *Research Methods in Applied Linguistics*, 5(3), 100356. <https://doi.org/10.1016/j.rmal.2026.100356>

REUSABLE MAGNETIC NANOMATERIAL DEVELOPED FOR PESTICIDE REMOVAL FROM WATER

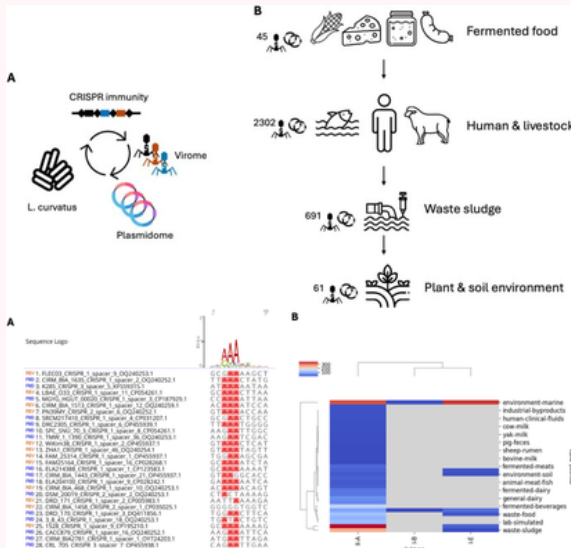
Metolachlor is one of the most frequently detected herbicides in drinking water sources and poses an environmental risk. In this study, a magnetic nanomaterial composed of iron oxide, the amino acid L-arginine, and activated carbon was developed, enabling its separation from water using a magnet. The metolachlor removal performance of the material was compared with that of other materials, including untreated and acid-treated activated carbon. At a high material dosage, 99.6% of metolachlor was removed, and the material largely maintained its performance under neutral and mildly alkaline conditions. After five reuse cycles, the material exhibited a regeneration efficiency of 93.2%.



Yagmur, F. E., Senol-Arslan, D., & Ates, N. (2026). Synthesis and mechanistic insights into metolachlor adsorption on L-arginine functionalized Fe₃O₄/activated carbon nanocomposite. *International Journal of Environmental Research*, 20(6), 264. <https://doi.org/10.1007/s41742-026-01226-x>



GENOMIC DIVERSITY OF A BACTERIUM FOUND IN FOOD AND THE GUT EXAMINED ACROSS 53 STRAINS



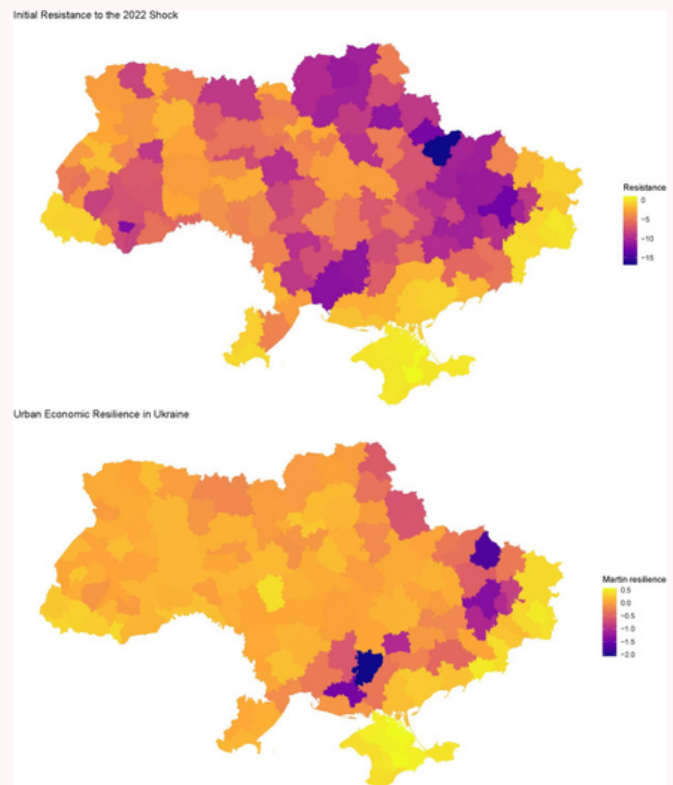
Latilactobacillus curvatus is an industrially important lactic acid bacterium found in fermented foods and the gut. In this study, genomes of 53 strains from food and intestinal sources were compared. The strains did not cluster by source, suggesting that horizontal gene transfer may contribute to adaptation. A total of 2,029 CRISPR spacers matching viruses and plasmids from different environments were identified. The findings highlight genomic features associated with the species' ability to adapt to diverse environments.



Kurt, I. C., Guner, H., Erdem, Z. A., Can, O., Gumustop, I., Sirin, A., Erol, I., Kotil, E. S., & Ortakci, F. (2026). Genomic evidence of ecological flexibility and cross-niche CRISPR spacerome targeting phage-plasmid hybrids in *Latilactobacillus curvatus*. *BMC Genomics*, 27(1), 760. <https://doi.org/10.1186/s12864-026-13098-8>

REGIONAL ECONOMIC IMPACTS OF THE WAR IN UKRAINE EXAMINED USING SATELLITE NIGHTTIME LIGHT DATA

Reliable regional-level data on the economic impacts of the war that began in Ukraine in 2022 are limited. In this study, satellite nighttime light data were used as an indicator of economic activity. Data from 2014–2024 were analyzed across 139 districts together with their distance from conflict locations. Districts closer to conflict areas experienced larger declines in nighttime light after 2022. Doubling the distance from conflict locations was associated with an approximately 3.5% smaller decline in nighttime light. The findings indicated that the economic impacts of the war were unevenly distributed across regions.



Michelangeli, A., & Türk, U. (2026). War, economic activity, and spatial inequality: Evidence from nighttime lights in Ukraine. *Research in Globalization*, 13, 100389. <https://doi.org/10.1016/j.resglo.2026.100389>



MATHEMATICAL MODEL DEVELOPED FOR MEASLES AND ASPIRIN-ASSOCIATED REYE SYNDROME

Measles remains a public health concern despite the availability of a vaccine. Aspirin use during the disease may lead to Reye syndrome, a rare complication in children. In this study, a mathematical model incorporating the effects of past states was developed to examine measles transmission and aspirin-associated Reye syndrome. The model was fitted to measles data from the United Kingdom for 2019–2023. Numerical simulations showed that combining increased vaccination with reduced aspirin use was more effective in limiting disease transmission than either strategy alone.

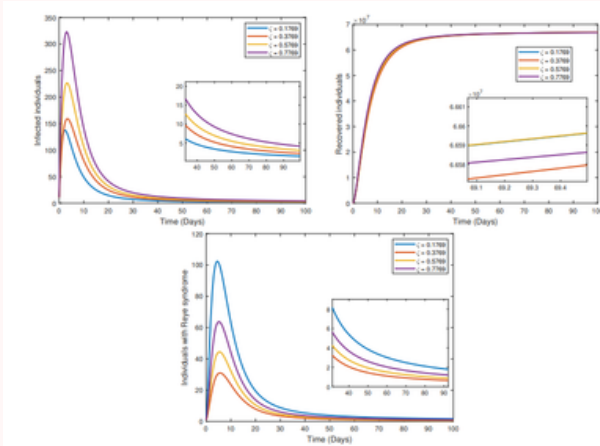


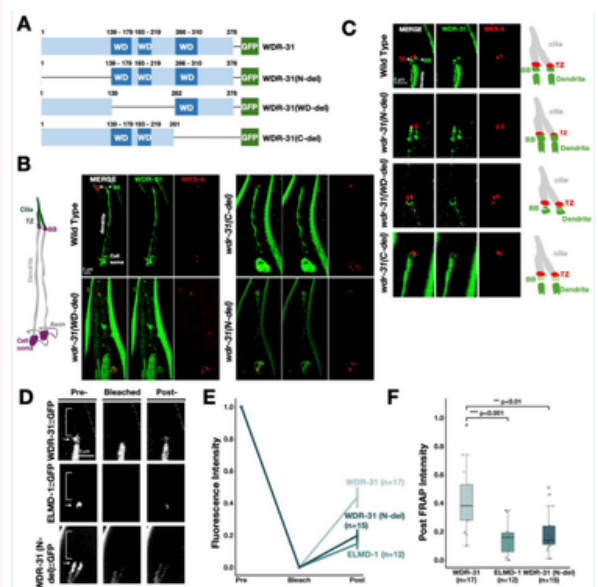
FIG. 11.9. Effects of the aspirin usage rate ζ on recovered individuals and individuals with Reye's syndrome at $\theta = 0.94$.



Kaya, E., Özköse, F., & Şenel, M. T. (2026). Caputo fractional-order model of measles and Reye's syndrome: Insights from UK surveillance data on stability and bifurcation. *Electronic Transactions on Numerical Analysis*, 65, 441–478. https://doi.org/10.1553/etna_vol65s441

ROLE OF WDR-31 PROTEIN REGIONS IN THE CILIARY GATE EXAMINED

Cilia are small, hair-like structures that enable cells to sense their environment, and their dysfunction can lead to diseases known as ciliopathies. In this study, the functions of three regions of the ciliary protein WDR-31 were investigated in a worm species using gene editing. Each region was found to be necessary for the proper localization of WDR-31 at the ciliary base. When any of these regions was removed and ELMOD- and RP2-like genes were also inactivated, the ciliary gate was disrupted, allowing a membrane protein normally excluded from cilia to enter.

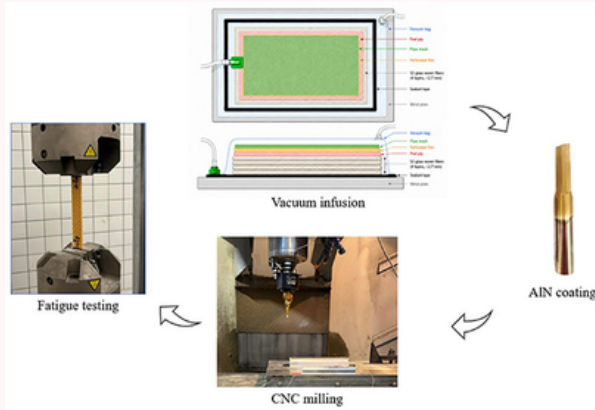


Çevik, S., & Güzel, F. (2026). The N-terminal, WD40, and C-terminal domains of WDR-31 control ciliary localization and cooperate with ELMOD/RP2 GAPs to maintain membrane compartmentalization. *Turkish Journal of Biology*, 50(4), 296–305. <https://doi.org/10.55730/1300-0152.2973>



FATIGUE LIFE OF COMPOSITE MATERIALS INCREASED BY 82.9% THROUGH OPTIMIZED MACHINING CONDITIONS

Glass fiber-reinforced composite materials are widely used in fields such as aerospace and defense. Milling these materials can cause structural damage and affect their durability. In this study, the effects of cutting speed, feed rate, cutting direction, and tool coating on the fatigue life of S2-glass fiber composites were experimentally investigated. Cutting speed had the greatest effect on fatigue life, followed by cutting direction. The longest fatigue life was achieved at a cutting speed of 750 rpm with the tool rotating in the feed direction. Optimizing the machining conditions increased fatigue life by 82.9%.



Eltahir, S. S. A., Seçkin, M., Danisman, Ş., Sayın, A. Ç., Ersoy, E., Kesriklioğlu, S., & Yılmaz, Ç. (2026). Investigation of milling-induced effects on the fatigue life of S2-glass composite structures through experimental study and statistical optimization of machining conditions. *Materials Research Express*, 13(18), 185301. <https://doi.org/10.1088/2053-1591/ae9d00>